Executive Summary

This report presents the results done to assess the economic impact the implementation and use of consensus-based standards in the construction industry. The assessment was done on PPC Cement Ltd, which is a cement manufacturing company. PPC Cement has eight manufacturing plants and three milling depots. Together these facilities are capable of producing almost eight-million tons of cement a year. Related products include aggregates, metallurgical-grade lime, burnt dolomite and limestone.

ISO developed a methodology that assists in assessing and quantifying 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 personnel in the company have assisted in quantifying the impact that standards have at a functional level as well as on the company as a whole.

The company under assessment confirmed the importance of standards and the direct impact standards have on sales and costs. At each selected business function, standards showed a contribution towards savings in costs and an increase in sales. Furthermore, the study uncovered apart from the quantitative aspects there are also the qualitative benefits derived from the use of relevant standards. Due to the systematic use of standards PPC Cement have the ability to assess and select suppliers that can supply to the stringent requirements to national standards.

The implementation of ISO 14001 by PPC Cement has resulted in lower energy consumption and a better environmental management. The use of OHSAS 18001 has created a safer working environment for the employees and, indirectly, the safety of the public. Taken together, the measures above have contributed to increasing the reputation of PCC in the eyes of its stakeholders.
# Table of contents

Executive summary ....................................................................................................................... 2
Table of contents .......................................................................................................................... 3

1.  Objectives and organization of the pilot project ................................................................. 4

2.  Introduction of the selected company ............................................................................... 5

3.  Attitude of the company towards standardization ........................................................... 6

4.  Analysis of the value chain ............................................................................................... 7
   4.1 Industry value chain ......................................................................................................... 7
   4.2 Company value chain ....................................................................................................... 11
   4.3 Key value drivers ............................................................................................................ 12

5.  Scope of the assessment in the pilot project ..................................................................... 13

6.  Use of standards by the company: Standards used in the company value chain .......... 14
   6.1 Standards being used in company .................................................................................. 18

7.  Selection of operational indicators to measure the impacts of standards .................... 19

8.  Calculation of the economic benefits of standards .......................................................... 20
   8.1 Summary of the financial impact of standards ............................................................... 21

9.  Qualitative and semi-quantitative considerations ............................................................. 21

10. Evaluation of the results ..................................................................................................... 22

11. Conclusions ......................................................................................................................... 24
    11.1 Limitations ..................................................................................................................... 25

Bibliography .............................................................................................................................. 26

Annexes ...................................................................................................................................... 27
1. Objectives and organization of the pilot project

Standardizers always 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 real world 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, so as to raise awareness and improve communication thereby promoting the use of standards and encouraging stakeholder participation.

To assess the economic benefits of standards, the International Organization for Standardization (ISO) developed a methodology which assists in assessing and quantifying the economic value that standards contribute towards a company. The study is based on the principle of capturing data at the operational level where standards have a more direct impact.

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 associated with using standards.

The project began on the 1st of October 2010 and ended on 15th March 2011. The project coordinators include: Terrence Moodley (Senior Manager of Standards Sales and Promotions) and Praneshri Pillay (Researcher for SABS). The report was reviewed by Reinhard Weissinger, Manager of Research, Education and Strategy at ISO and Professor Ian Jandrell, Head of the School of Electrical and Information Engineering, from the University of the Witwatersrand, South Africa.

The overall approach is based on the value chain analysis. A value chain is a series of interlinked 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 of understanding and quantifying the contributions of standards to value creation.
2. Introduction of the selected company

South Africa’s construction sector has experienced a decade of considerable growth and success, particularly as a result of the buoyant property market and the government’s considerable infrastructure spending in the mid- and late-2000s. The global recession has, as in most sectors, put a damper on that growth. Despite the recession, however, the 2010 Soccer World Cup sustained a number of construction companies, with demand for stadiums, new transport infrastructure and World Cup accommodation. As the economy slowly started to emerge from the global recession, construction investment should average 9.6% of GDP (Gross Domestic Product) during the next three years [Industry Insight (2010) www.industryinsight.co.za 2009].

Pretoria Portland Cement Company Limited (PPC Cement) operates within this highly dynamic industry. PPC Cement was selected as the assessment company for the study because of its well-established brand and its prolific implementation of national and international standards in its business.

Established in 1892 with a factory in Pretoria, the company has grown to include operations across South Africa, 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.

A hundred and eighteen 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 a 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 has produced cement, aggregates and lime and developed as a distribution company, playing a vital role in the history and overall development of Southern Africa.

It is a reliable supplier of cement and materials into 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.

According to management, PPC has had to contend with a third consecutive year of declining cement demand in its principal markets in 2010 as cement sales in South Africa dropped more than 20% below 2007 levels.

The decline in South African cement sales was partially offset by rising cement demand in Zimbabwe and a strong recovery in lime sales to the South African steel industry. The continued decline in South African cement demand is mainly due to a depressed residential
market, which has been the major contributor to demand in recent times. This has been exacerbated by subdued activity in the construction sector since the completion of projects associated with the 2010 FIFA Soccer World Cup tournament, followed by a slowdown in tender adjudication for large infrastructure projects. Government’s budget and plans for infrastructure projects, many of which are cement intensive, appear to be hampered by a lack of capacity to get these projects off the ground.

The PPC team pursued many options to ensure that the company could withstand the current economic environment, including increased focus on sales and marketing activities and customer service. When demand exceeded capacity during 2005 to 2008, the organization understandably concentrated its efforts on production optimization and product availability.

PPC Cement’s main competitors in the cementitious materials market are Afrisam, Lafarge (South Africa) and NPC-Cimpor.

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.

PPC Cement manufactures products that have to meet regulatory requirements and standards help PPC to achieve this. The standards allow PPC to apply standardized test methods, which make it easier to prove compliance with the regulation, while on the other hand the regulator uses references in laws to the very same standards to regulate the industry in which PPC operates. PPC also applies voluntary standards throughout its organization so as 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. PPC is of the opinion that by participating in developing national and international standards it will broaden its competitive scope 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 gives PPC leverage to introduce or promote changes to existing or new standards, with a view to align its processes and technology with the requirements of the new and revised standards.

The company is certified against the following system standards: SANS/ISO 9001, SANS/ISO 14001, OHSAS 18001 and SANS/ISO 17025 and certified to the following product standards: SANS/ISO 50197-1, SANS/ISO 50197-2 and SANS 1841 (refer to table 6.1)
Management’s views on the benefits of standards

Management across all functions acknowledge that PPC derives economic benefits from the implementation of standards, however because PPC and its competitors are all expected to implement the same standards to show compliance to regulations, there is no distinct competitive advantage for PPC Cement. They believe that five years ago businesses were not as entrenched in applying standards as they are currently being applied and there could have been competitive advantage back then but not any longer.

They are also of the opinion that participating in standard-setting committees provides benefits for PPC Cement as they are able to influence the content of a standard since they have a better understanding of their industry and its requirements. They also have insight into and earlier access to technical information, which give them a head-start in preparing and gearing up their business in order 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 benefited their company, discuss obstacles in applying standards and learn how to overcome them when implementing the standards within their own company.

4. Analysis of the value chain

4.1 Industry value chain

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

The rotary cement kiln is the world’s largest moving manufacturing machine and one of the hottest. It is typically set on a slight incline and rotates from 1 to 4 revolutions per minute. A large kiln may process more than 300 tons of raw meal an hour. The raw meal is heated in the kiln to extremely high temperatures, about 1,450°C (2,700°F). The high temperature processing causes the raw meal to react and form complex mineral compounds. These compounds exit the kiln as a hard nodular material called “clinker.” Many modern 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.
**Figure 1 – Value chain of cement-based building materials**

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 major contributor to the demand of cement, for PPC Cement, is the residential market as well as large infrastructure projects tendered by the government.
Figure 2 - The key process stages in cement production are shown below:

- **Quarrying and crushing**: Here the rock is crushed to stone less than 25mm in diameter. About 1.5 tons of limestone is needed to produce one ton of cement.

- **Blending and storage**: Systematic sampling and laboratory testing monitor this process. Other raw materials normally iron ore and sand, are also stored in stockpiles.

- **Raw milling and homogenization**: homogenizing silos where it is mixed thoroughly to ensure efficient functioning of the kiln and for good quality clinker.

- **Burning**: meal reaches a temperature of about 1450°C when a process called clinkering occurs. Cooled clinker nodules are taken away to clinker storage silos.

- **Cement milling**: required for the setting times of cement. Finished cement is stored in silos where further blending ensures consistency.

- **Dispatch of cement**: directly onto the truck or palletized. The pallets can be covered in plastic to offer further protection from the elements.

Limestone is the primary raw material used for the production of cement. It is obtained from a quarry where rock is blasted and transported to a crusher.

The crushed rock is stored in stockpiles, where blending takes place, and a uniform quality of raw material is achieved.

Various raw materials are fed into mills where steel balls grind the raw meal. The raw meal is then stored in homogenizing silos where it is mixed thoroughly to ensure efficient functioning of the kiln and for good quality clinker.

This is the most critical step in the manufacturing process. Raw meal is fed into one end of a rotary kiln and pulverized at the other end. The raw meal reaches a temperature of about 1450°C when a process called clinkering occurs. Cooled clinker nodules are taken away to clinker storage silos.

Cement mills grind the clinker with a small quantity of gypsum to fine powder, called cement. Gypsum is required for the setting times of cement. Finished cement is stored in silos where further blending ensures consistency.

Cement is dispatched in bulk or packed 50kg bags and distributed from the factory in rail trucks or road vehicles. The 50kg bags are either packed directly onto the truck or palletized. The pallets can be covered in plastic to offer further protection from the elements.
4.2 Company value chain

For the analysis of the company value chain, the widely used model developed by Michael Porter from Harvard Business School is applied, which divides the value chain of a company into primary and supporting functions and categorizes the activities in companies into nine different business functions. Using this model, the company value chain for PPC Cement can be described as follows:

Supporting functions:

A. Management & Administration
B. Finances
C. Human Resources
D. Research & Development (R&D)
   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 government legislation and guidelines.

Primary functions:

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 & Sales
   Activities include: Marketing activities; Contracting; Sales. Has various supporting functions which include:
   Credit
   Maintenance
   Laboratory
   Dispatch
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:

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

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 quality that suppliers can provide. PPC Cement might forego cost for better quality, better response, etc. as cement manufacturing takes place 365 days a year, 24 hours a day. If a supplier cannot provide raw materials on the weekend, then PPC Cement will opt for another supplier able to do so.

The main value driver for the **R&D function** is R&D effectiveness, which is an indication of the cost-effectiveness of the R&D activities. This is a relevant value driver because of the need of development and continuous improvement of products. The company must comply with SANS 50197, i.e. the manufacturing of cement has to conform to the regulation 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.

The main value driver for the **Production/Operations function** is the quality of the final product, for this influences customer buying patterns since customers are always comparing the benefits and value of the products to the costs. This is a relevant value driver due to high customer expectations and various product options. Other value drivers include the efficiency of production with regard to internal operations, which is an indication of the cost-effectiveness of production.

The main value driver for the **Sales & Marketing function** is sales effectiveness, i.e. generate more revenue. This is a relevant value driver as all cement manufactures produce cement to the same minimum standard specifications to meet regulatory requirements.
5. **Scope of the assessment in the pilot project**

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

- Research & Development
- Procurement
- Production/Operations
- Sales & Marketing

The reason for the selection of these business functions follows the sequence of our interviews in PPC cement: Our initial interview with the Quality Assurance manager gave us an idea of what standards were important to PPC Cement and how they were implemented.

**Research & Development** was chosen as this department uses standards to improve production processes and to keep up with technological advancement; standards therefore definitely have an impact on this function.

**Procurement** needs to source supplies from suppliers who are using standards. As mentioned before, all standards that are applied to raw materials will eventually contribute to the quality and costs of the end product and therefore standards would impact this function as well.

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

Standards also have an impact on **Sales & Marketing** as the products carry the SABS mark, which gives consumer confidence. This will affect the sales of the product, which in turn will impact on production/operations because of forecasts from sales and marketing.
6. Use of standards by the company: Standards used in the company value chain

The company has implemented the following standards:

**SANS 9001**, specifies the requirements for a quality management system; it motivates the staff of any organization, by defining their key roles and responsibilities. It provides the company with the following benefits:

- Cost savings can be made as a result of a competent work force
- Improvements are developed from product and service deficiencies, resulting in less waste, inappropriate or rejected work and fewer complaints
- Customers notice that orders are met consistently, on time and to the correct specification; this in turn opens up the market place to increased opportunities.

**SANS 14001**, is an environmental management system that offers an organization a set of environmental goals that allows it to achieve continual improvement and prevention of pollution as stated in the standard. Cement-making raw materials do 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). The implementation of SANS 14001 allows the company to reduce:

- Quantities of wastes sent to landfill
- Energy use (electricity, coal, fuel oil, gas)
- Loading of effluent contaminants discharged
- Emissions of gases and particulates to the atmosphere, e.g. an electrostatic precipitator (ESP) is used to control dust emissions; applying SANS 14001 will ensure that the dust emitted will not have an impact on the environment
- Amounts of raw material used
- Amount of packaging for purchased goods and shipments of product
- Increase amounts of recycled wastes – paper, plastic etc.

**OHSAS 18001** is an international standard for managing health and safety. Workers involved in the production of cement are often at risk of getting injured, e.g. coming into contact with hot clinker or cement or other dangers from machinery. All PPC cement factories are OHSAS 18001 certified. By applying this standard the company has the following benefits:

- 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 costs associated with legal fees and compensation
- 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 against recognized standards
• Ability to win more business – particularly where procurement specifications require certification as a condition to supply raw materials.

Many of PPC’s factories and depots have been rated, by an independent certification body, as five-shield sites. Five-shield status is awarded for an audit score >95% and a lost-time injury frequency rate of <1.

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

PPC Cement uses the following established national standards on its products:

**SANS 50197-1** is a compulsory specification which is used for common cements and specifies a number of properties and performance criteria. 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 with which cements must comply.

**SANS 50197-2**, specifies strengths which are determined in accordance with SANS 50196 – Methods of testing cement (consisting of seven parts) to be carried out by a certification body. The certification body (body possessing competency and responsibility to carry out conformity certification) for PPC Cement is SABS.

PPC uses some of the testing standards listed below to make sure that requirements for certain cement have been met:

- **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. For this, PPC uses some of the same testing methods mentioned above.

**SANS 1841** specifies the requirements for the control of the quantity of the contents of prepacked products that are packed 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 terms of legal metrology legislation.

The quantity mark scheme is an e-mark which can be applied to prepacked products and acts as a guarantee that the product has been packed in accordance with SANS 1841. A company wishing to apply the e-mark to prepacked products must register with the NRCS (National Regulator for Compulsory Specifications). Legal Metrology will then assess the company against the requirements of the standard, especially the effectiveness of process control, and perform quantity checks on prepacked products. If the results are positive, Legal Metrology will issue a certificate as confirmation that the company is capable of meeting the required standard and register it under the Quantity Control Scheme. The company is then audited twice per annum to ensure compliance. PPC has the e-mark on all its cement products.

R&D does use some standards developed by the American Society for Testing & Materials (ASTM) for background information and cross-referencing, and if an overseas company would like to import its cement, PPC might have to do tests against ASTM requirements.

In **Procurement** standards are used to facilitate best practices with regard to structuring of supplier contracts, which makes it easier to assess and engage potential suppliers. PPC is confident in the knowledge that when suppliers comply with the relevant standards, the goods and services procured from them are of a consistent quality (e.g. sand and its chemical compositions must comply with standard specifications), which will ultimately contribute to the quality of the end product.

Suppliers must also be certified against management systems such as SANS 9001 and be environmentally certified. If suppliers are not certified at an international level, this will not pose a problem as PPC is looking to apply products to the South African environment. If PPC has a relationship history with these suppliers, they will be used.

Safety standards are also important as PPC will not associate itself with suppliers working in unsafe environments.

The use of standards within **Research & Development** contributes towards its effectiveness, by improving staff competency and minimizing R&D costs.
Standards are used to ensure that manufacturing processes are compatible and upgraded regularly to new technology, thus providing a more efficient manufacturing process.

Research & Development is not a profitable function; it incurs costs to develop new projects which will in turn determine future profitability. Standards can have a positive impact on Research & Development costs if PPC is investigating a potential product.

Management also indicated that the scope for competing internationally is also broadened when applying certain international standards.

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

The use of standards within **Sales & Marketing** ensures higher sales due to customer confidence in standardized products.

The use of standards also ensures more efficient contractual agreements, as defined specifications of the company’s products and customer requirements make concluding contractual agreements easier.

New staff in Sales & Marketing can be trained better because relevant specifications are standardized, for both products and services.

PPC Cement has systems in place to support the implementation of these standards, such as:

- **Achiever plus**: this is a software and self-help solution designed to help PPC implement and maintain an Integrated Management System for its SANS 9001, SANS 14001 or OHSAS 18001 certification;
- **QCX**: this software allows for the automatic control of the composition of raw materials used in cement manufacture; and
- **Laboratory Information Management Systems (LIMS)**: software that helps keep control of procurement of laboratory equipment.

Overall, PPC is capable in its ability to implement standards as it shows initiative in not only using the standards to show compliance, but also to improve its business.
### 6.1 Standards being used in the company

<table>
<thead>
<tr>
<th>Current version of standards used</th>
<th>*Used In PPC Cement since...</th>
<th>Main functions of the standard</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Regulated Standards</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SANS 50197:2000 (parts 1 and 2)</td>
<td>1993</td>
<td>The standard specifies composition of cements according to the proportion of constituents, Portland cement, extenders and fillers. It also aids legislative compliance.</td>
</tr>
<tr>
<td>SANS 1841: 2008</td>
<td>2003</td>
<td>This standard specifies requirements for the control of the quantity of contents of prepacked packages that are packed in accordance with the prescriptions of legal metrology legislation.</td>
</tr>
<tr>
<td><strong>Voluntary Standards</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ISO/IEC 17025:2005</td>
<td>2003</td>
<td>Specifies the general requirements for the competence of testing and calibration, including sampling.</td>
</tr>
<tr>
<td>ISO 9001:2008</td>
<td>1990</td>
<td>Specifies the requirements for a quality management system.</td>
</tr>
<tr>
<td>OHSAS 18001:2007</td>
<td>2007</td>
<td>This is an occupational health and safety management system specification. It provides a framework that allows PPC to consistently identify and control its health and safety risks, reduce the potential for accidents and improve overall performance.</td>
</tr>
<tr>
<td>SANS 14001:2005</td>
<td>1996</td>
<td>The standard sets out how PPC can go about putting in place an effective Environmental Management System (EMS). The standard is designed to address the delicate balance between maintaining profitability and reducing environmental impact.</td>
</tr>
<tr>
<td>EN 451-1: 2003</td>
<td></td>
<td>Method of testing fly ash.</td>
</tr>
</tbody>
</table>

*In case the year given in the 2nd column is earlier than the current version of the standard in column 1, this means that the earlier version of the standard was implemented by PPC Cement*

**Note:** A list of the standards below with their titles is given in Annex 2 of this report.
### 7. Selection of operational indicators to measure the impacts of standards

<table>
<thead>
<tr>
<th>Selected business functions (BF)</th>
<th>Related activities</th>
<th>Value drivers (if applicable for the BF)</th>
<th>Standards used</th>
<th>Operational indicators</th>
<th>Definition of the indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research &amp; Development (R&amp;D)</td>
<td>Research</td>
<td>R&amp;D effectiveness</td>
<td>SANS 50197</td>
<td>Personnel costs (direct assessment by manager)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Product development</td>
<td></td>
<td>ISO 17025, ISO 9001, SANS 1841</td>
<td>Indicator 1 - Clearer product specifications: Standardized specifications of the suppliers’ products make it easier to collect relevant information.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ISO 18001, ISO 14001</td>
<td>Indicator 2 - Better internal information transfer: Using standardized documents and specifications makes passing on information within R&amp;D about products and services more efficient</td>
<td></td>
</tr>
<tr>
<td>Procurement</td>
<td>Screening and selection of suppliers</td>
<td>Relationship-building</td>
<td>ISO 9001, ISO 14001, ISO 18001</td>
<td>Indicator 3 - Better internal information transfer: Internal information about products and services is passed on more efficiently by using standardized documentation and specifications.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Negotiating and contracting</td>
<td></td>
<td></td>
<td>Indicator 4 - Better training: Production/Operations staff can be trained better because relevant specifications are standardized, for both products and services.</td>
<td></td>
</tr>
<tr>
<td>Productions/Operations</td>
<td>Processing</td>
<td>Quality of products</td>
<td>ISO 9001, SANS 50197, ISO 18001, ISO 14001, SANS 50196-1, SANS 50196-2, SANS 50196-3, SANS 50196-6, EN 451-1</td>
<td>Personnel costs (direct assessment by manager)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Quality assurance</td>
<td></td>
<td></td>
<td>Indicator 5 - Higher sales: Sales are higher due to customer confidence in standardized products</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Quality control</td>
<td></td>
<td></td>
<td>Indicator 6 - More efficient contractual agreements: Defined specifications of the company’s products and customer requirements make concluding contractual agreements easier.</td>
<td></td>
</tr>
<tr>
<td>Sales &amp; Marketing</td>
<td>Marketing Activities</td>
<td>Sales effectiveness</td>
<td>ISO 9001, SANS 1841, ISO 14001, ISO 18001</td>
<td>Sales &amp; Marketing costs (direct assessment by manager)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Contracting</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sales</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Economic benefits of standards – Pilot projects – Final report: South Africa
8. Calculation of the economic benefits of standards

<table>
<thead>
<tr>
<th>Selected business functions (BF)</th>
<th>Operational indicators (to measure the impact of standards)</th>
<th>Savings/Impacts</th>
</tr>
</thead>
</table>
| Research & 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 & Marketing               | Sales revenue                                               | Indicator 5: the sale of standardized products will be 2.1% lower. |
|                                 | Personnel costs                                             | Indicator 6: the time used to negotiate contractual agreements has reduced by 12%. |

8.1 Summary of the financial impact of standards

<table>
<thead>
<tr>
<th>Selected business functions (BF)</th>
<th>Financial impact of standards on all BFs (for 2009) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research &amp; Development</td>
<td>14.3%</td>
</tr>
<tr>
<td>Procurement</td>
<td>0.2%</td>
</tr>
<tr>
<td>Productions/Operations</td>
<td>1.3%</td>
</tr>
<tr>
<td>Sales &amp; Marketing</td>
<td>14.1%</td>
</tr>
<tr>
<td>Total financial impact: 2.5%</td>
<td></td>
</tr>
</tbody>
</table>

The total financial impact of standards is 2.5% of the company’s total revenue (R5.9 Billion) and is based on the impact of standards in the year 2009, on the selected business functions.
9. Qualitative and semi-quantitative considerations

There are other intangible aspects to standards that cannot be quantified, but could still be considered to demonstrate 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’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 cement as PPC is always producing consistent products. Peer recognition from other competitors in the industry is another benefit, because PPC is also recognized as a competitor.

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

Environment

The implementation of environmental standards reduces the amount of energy and lowers the quantity of waste associated with the manufacturing of cement, thus creating a sustainable environment.

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

Health & Safety

The implementation 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 the employees, ultimately the use of standards within any company or industry is to ensure the safety of the public. It is imperative that, if a bridge is going to be built, only the best cement is available to build it, so that it does not collapse.

10. Evaluation of the results

The overall result showed a total financial impact which is 2.5% of the total company revenue (2009), which is relatively high. The total financial 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 on which it was perceived that standards had the strongest impact. However, this is the result from one company in the construction industry sector; we would need to sample more than one company to get a conclusive result for the entire construction industry.

At each function it is apparent that a cost saving due to the use of standards has been made. Standards show a positive impact on costs, mostly as a result of the reduction of personnel costs in each of the selected functions. The strongest impacts can be seen in Research & Development and in Sales & Marketing.

**Procurement** has a total cost savings of 0.2% (financial impact calculated as a percentage of total Procurement costs). The use of standards primarily saves time in passing on internal information about products and services by using standardized documentation and specifications, thus ensuring that more efficient processes are run in Procurement which in turn will contribute to the quality of the end product.

**Productions/Operations** have a total cost savings of 1.3% (financial impact calculated as a percentage of total Production/Operations costs). The use of standards primarily saves time in the training of staff as relevant specifications are standardized, for both products and services. Staffs are trained more efficiently as they are working to an internal quality management system that is based on standards. The use of standards within the production process will ensure that there is no stoppage of equipment that will result in wastage of raw materials and inconsistent products, thus ensuring a more efficient production process, thereby contributing to the quality of the end product.

**Research and Development** has a total cost savings of 14.3% (financial impact calculated as a percentage of total Research and Development costs). The use of standards primarily saves time in collecting relevant information because of the standardized specifications of the suppliers’ products and customer requirements. Using standardized documents and specifications also makes passing on information within R&D about products and services more efficient. As technology changes so do the demands of customers; there is thus a need to continuously improve products and services. One of the ways R&D can accomplish this would be to look at international best practices to determine how R&D can use and incorporate these practices and also try to influence the development of international standards to benefit PPC Cement.

**Sales and Marketing** had a personnel cost saving of 12% (financial impact calculated as a percentage of total Sales and Marketing costs). The use of standards primarily saves time spent on contractual agreements due to defined specifications of the company’s products and customer requirements.

The sales revenue is also affected as the sales of standardized products would be 2.1% lower without the use of voluntary standards.
PPC Cement and other cement manufacturers operate in a regulated environment in South Africa; they all have to comply with minimum standard specifications in order to sell their product. SANS 50197 is used to show compliance to regulation. Because this is considered the “norm” for all cement manufacturers, regulated standards do not present a competitive advantage.

Besides SANS 50197, other voluntary standards are also used by the company, e.g. the environmental, health and safety, and quality management standards. 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 that can be attained through the use of these standards.

However, using these standards in one’s company does not mean that there is a discernible competitive advantage, especially if the company is setting its sights on compliance rather than improving its business. Because standards bring about benefits such as customer confidence; cost efficiency and increased revenue, PPC Cement should continue participating in the development of standards.

As mentioned before, the results show positive impacts on costs at each of the selected business functions and revenue in Sales & Marketing. It would be valuable to PPC to systematically examine how standards operate and work and how PPC could further exploit the benefits that arise from the use of standards. This can be done by further extending the list of operational indicators used in this study to measure the value contributed by standards in the other business functions along the company value chain and in that way systematically monitor how standards impact operations at PPC.

PPC can further improve the impacts of standards by using and incorporating international best practices and trying to influence the development of international standards to the benefit of PPC. This will in turn better serve PPC as it would catapult it into the international arena. This would allow PPC to compete at an international level and to export cement not only to other African countries, but to Europe, America and other countries overseas, thereby increasing the sales and production of cement.

Given that we were able to quantify the value that standards contribute to PPC Cement, as a cement manufacturing company in the construction industry, we can further determine the economic benefits of standards with regard to the entire construction industry. By applying this methodology to other companies within the construction industry, we would have a better idea of the value that standards contribute towards this industry.
11. Conclusions

PPC is a well-established cement manufacturing company and possesses a strong drive to become the leading cement manufacturer in the country. It applies national and international standards throughout its operations because of their strategic value. PPC also has the required systems in place to support the implementation of these standards.

Even though PPC is certified against both product and system standards, management are of the opinion that the implemented standards do not bring about a competitive advantage because PPC’s competitors are also applying the same standards. They do, however, acknowledge that there are economic benefits to be derived from the implementation of standards.

Through the study we were able to estimate the economic impact that standards have on the company. Standards show a relatively strong financial impact in the Sales and Marketing function; this is due to the benefits of using voluntary standards, which provide a key element in the company’s marketing strategy.

Standards contribute to the cost savings in all four of the selected functions and have the most impact on personnel costs. The use of quality management standards, e.g. SANS 9001, and health and safety management standards, e.g. OHSAS 18001, contributes to cost savings by ensuring that PPC has a competent work force, well-trained staff and minimal health and safety risks thereby reducing personnel costs.

Apart from using standards to ensure cost-efficiency, standards instil customer confidence because standards are used at every stage of the cement production process, which ensures a consistent and a quality end product. Since standards are used as a means to achieve customer confidence and cost-efficiency, PPC can promote the further use and monitoring of standards.

Standards are important to cement manufactures as cement cannot be sold if these manufactures do not meet the minimum regulatory standard requirements. Therefore, all the major cement manufacturers have to comply with these regulations. This leaves little leverage in terms of gaining a competitive edge over PPC’s 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 implementation 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.

The economic impact of standards cannot be measured easily. This study provides a methodology which quantifies the value that standards contribute towards corporate value creation. The study was done on one company. Thus, the outcome of the study is not necessarily a reflection of the entire South African construction industry. The sample size
needs to be extended in order to determine the true economic impact of standards on the construction industry.

**Limitations**

Because standards are so entrenched in PPC, it was difficult to compare both scenarios, i.e. before and after implementation of standards. It was required that we needed to quantify the reduction in costs/revenue that occurred because of the use of standards. However, most of the standards were in place for a while, which made it difficult to compare figures.

The other challenge was that, because standards are integrated into systems at PPC, interviewees found it difficult to view the benefits of standards in isolation, i.e. most of them started work in an environment that was already standardized. They could therefore not fully appreciate the benefits that standards bring to the workplace.

Because PPC Cement operates in a regulated environment, it was difficult to disassociate the benefits of voluntary standards from those of regulated standards for, even without the implementation of voluntary standards, PPC will still be in a position to sell its final product. The study would have been made much easier if PPC only applied voluntary standards.
Bibliography


Annexes

Annex 1: Names and Functions of individuals in PPC Cement that have been interviewed

Name: Avinash Bhervia
Position: Risk Manager
Function: Sales & Marketing

Name: Herman Vermeulan
Position: Senior Quality Assurance Manager
Function: Productions/Operations

Name: Bheki Mthembu
Position: Group Manager Quality Assurance
Function: Research & Development

Name: Mark Jones
Position: Regional Quality Assurance Manager
Function: Research & Development

Name: Ajesh Sooklall
Position: Manager
Function: Procurement

Name: Elmarie Van der Merwe
Position: Manager
Function: Procurement
Annex 2: List of standards with their titles, used in PPC Cement

SANS 50197-1, Cement – Part 1: Composition, specifications and conformity criteria for common cements in legislation.


SANS 1841, Control of the quantity of contents in prepacked packages within the prescriptions of legal metrology legislation.

SANS 9001, Quality Management Systems – Requirements.

OHSAS 18001, Occupational health and safety management systems – Requirements.

SANS 14001, Environmental management systems – Requirements, with guidance for use.

SANS 17025, General requirements for the competence of testing and calibration laboratories.


