Evaluation of the Nissan Plant Management System as a global improvement tool and the role of Hoshins

A. Nicolaides and P. Harding

1Human Sciences Faculty
Vaal University of Technology, PO Box 21357, Helderkruin, 1733
2Managing Director
South African Quality Institute, Pretoria, South Africa.

Corresponding Author: A. Nicolaides

Abstract
This paper examines the Nissan Plant Management System (NPMS) as a global improvement tool and examines the roles of Hoshin kanri (policy management) in middle and shop floor management in Nissan South Africa (NSA). How Nissan achieves synchronisation with its customers and how it identifies production problems and puts solutions in place are also aspects which are investigated. The great success of Japanese management techniques such as the NPMS and the role of hoshins in this success should generally serve as an example to companies who are serious about quality outputs. Such innovative techniques can and should be applied to many industries. In a continual modality of quality improvement, workers are given both the authority and responsibilities to enhance their performance and this is important for management practitioners to note if success is to be achieved.

Keywords: quality, innovation, management systems, processes, performance.

INTRODUCTION
The Japanese have for decades had a phenomenal impact on world markets. Many industries including automotive products, are either towered over by Japanese firms or are very heavily impacted upon by them. In March 1999 during a severe economic downturn, Nissan acquired large debts from imprudent keiretsu and property investments. Consequently, the company forged an alliance with the French motor vehicle manufacturer Renault. Such alliances require considerable thought and trust between partners (Gulati & Nickerson, 2008). This alliance necessitated a comprehensive review of Nissan units including its overseas plants such as NSA. Changes were introduced, including the use of hoshin kanri (policy management auditing) in Nissan’s overseas plants, aimed especially at middle and shop-floor management. Executive teams were tasked to review the manner in which NSA personnel develop their competences for the effective management of strategic objectives at the operational level.

Nissan South Africa (NSA), which operates in an unrestricted, and highly competitive, motor vehicle market, has supplied quality vehicles to South African customers for over forty years. Originally through the importation and local assembly of completely-knocked down (CKD) vehicles, and subsequently through the establishment of manufacturing facilities at Rosslyn, near Pretoria, Nissan and its forerunner, Datsun, provide effective transport solutions for South Africans while greatly enhancing the country’s motor industry. NSA has almost a 10 per cent share of the total South African vehicle market. It supplies a fully inclusive range of passenger cars, light and medium commercial vehicles and recreational and specialised vehicles manufactured in South Africa although some types are imported from sister plants around the world. NSA is presently busy in a dynamic programme of new model introductions and the company employs over 2,500 people in South Africa and 1,900 employees are in the manufacturing division, and training is therefore an important tool for driving improvement and promoting transformation. An ideal condition of manufacturing, (douki-seisan), must be reached for optimum efficiency and profits to be realized. A fixed sequence and time schedule production that supports the pipeline from order to delivery which satisfies customer needs is the desired objective. The reduction of lead-time for production and development so as to synchronize production with Nissans customers (douki) as closely as possible is critical to success. Essentially customers must receive what they order on time and in excellent condition.

A unique business model was created by the Renault-Nissan Alliance and this has built significant value for both companies. How companies approach amalgamations and alliances is very important for future success (Lavie, 2006). Both companies have integrated and evolved an effective production
methodology which draws on both the Nissan Production Way and the System Production Way of Renault. In this partnership, overall equipment efficiency is vital, followed by quality control, efficient ergonomics and kaizen of productivity followed by JIT production. In terms of Genba Kanri, staff is managed daily and there is new model management. These are then followed by course expansion programmes. For over a decade now, Employees at Renault and Nissan have worked as partners with an attitude of mutual respect and company pride while maintaining their brands and corporate identities. The purchasing departments of the companies, as the principal supplier interfaces, have a specific and commonly executed role in the success of supplier relationships, and with associated performance results (http://www.nissan-global.com/EN/DOCUMENT/PDF/SR/Renault_Nissan_Purchasing). The purchasing departments of the companies have specific procedures for identifying and selecting potential suppliers the intention of which is to create best value for the end-customer, by integrating the supplier’s components and services into the final product. These procedures are consistent throughout Renault and Nissan and are globally applicable. The selection of all suppliers is made on clear, open and transparent internal processes, and each of these is based on a factual evaluation of suppliers’ results, when weighed up against all Renault and Nissan supplier requirements for whichever market. (http://www.nissan-global.com/EN/DOCUMENT/PDF/SR/Renault_Nissan_Purchasing).

**Performance Objectives Renault-Nissan Alliance**

1. To be recognized by customers as being among the best three automotive groups in the quality and value of its products and services in each region and market segment.

2. To be among the best three automotive groups in key technologies, each partner being a leader in specific domains of excellence.

3. To consistently generate a total operating profit among the top three automotive groups in the world, by maintaining a high operating profit margin and pursuing growth.

The NSA Rosslyn plant is playing a vital role in supplying into the expanding South African market, and a programme of improvements are being rolled out within the plant and out into the supply chain. As part of its corporate social responsibility efforts, NSA is committed to training, educating and advancing its workforce to the maximum potential of each employee. Processes are thus being standardized, from the shop floor processes, to administrative processes to communications and even information flow.

**NSA as part of a Larger Japanese Keiretsu**

A *keiretsu* is an organizational structure which is uniquely associated with major Japanese corporations. The keiretsu are not single entities but rather created by a uniquely interdependent assortment of individual companies linked in a common enterprise through cross-shareholdership. Consequently, one member company within the keiretsu can thus have shares of stock in each of the other keiretsu members. The companies stay independent and are not subsidiaries of Japanese based holding companies. Not all Japanese businesses are keiretsu, but most of Japan’s large corporations are. There are two types of keiretsu namely the classical keiretsu and the vertically integrated keiretsu. The largest Japanese business groups are all examples of classical keiretsu and Mitsubishi, is one such company. These keiretsu are bank-centered with no specific central industry. There are also many single-industry companies in Japan which are considered to be vertical keiretsu. Nissan and Toyota, which are more pyramid-shaped in structure, are such companies. The company is at the apex of the hierarchical pyramid and the member companies like NSA, are lower down in the structure. Nissan is a vertically integrated corporate giant that focuses on a single industry, namely automobiles. Nissan, a single industry keiretsu, has become a sort of vertically-organized keiretsu that has grown out of a central manufacturing company and has links to companies which have specialized functions in the production of Nissan automobiles. Nissan’s orientation is thus vertical and spreads downward in a hierarchy of interrelated companies. Nissan also has closely affiliated companies it does not control directly and these are all essential to the continued success and growth of Nissan.

NSA has a new production control system in place that allows the Rosslyn plant to operate on the same principles as the European Nissan Plants. This has facilitated the migration from traditional CKD operations, where the plant received complete knock-down kits containing all the parts needed for vehicle assembly, to complete IPO operations via which the plant orders the individual parts required for the pre-planned assembly schedule directly. This has invariably led to flexibility at the NSA plant increasing considerably. Stock levels are thus better controlled and parts are more readily available. Once productivity and flexibility are enhanced, the supply chain becomes more efficient, and NSA is now more able to optimise the supply chain and introduce just-in-time delivery (JIT). In addition, NSA continues to source materials from other countries but the ultimate objective is to ensure that economic localization is increased.
Introduction to the NPMS Process

Nissan South Africa (NSA) had looked at various improvement techniques and limited success that had been achieved with the Nissan Plant Management System (NPMS). The question had been asked: can a global system developed in Japan fit into the NSA environment? In this article we will evaluate the NPMS as an effective global improvement tool.

The NPMS philosophy was first introduced to NSA in 1994, initially to be used in achieving a standardised system approach and later as a tool for monitoring the overall Business Plan requirements set out by Nissan Motors Limited (NML) in terms of improving Quality, Delivery and Cost results. From 1996 the monitoring of the NPMS introduction process had been focused on reviewing the achievement of the various Key Performance Indicators (KPI’s) against predicted targets. At the same time a step up score of between one and five as to the level of NPMS application being used was also measured, a score of one indicating entry level and five indicating master level. It had become clear over the 1998 /1999 NSA financial year period that the real driver of the NML executive was not solely the

NPMS system step-up score, to be clinically measured by Japan’s appointed auditor of the System, but rather the Business Plan achievement result it led to. The true test for NSA was how the application of this system could achieve the goals and objectives set by each division in terms of the Company’s bottom line result. Initially, many management members, as well as other staff, were confused as to what was the true purpose of the NPMS and questioned if it was capable of achieving the purpose for which it had been introduced. Few if any of the senior management team had linked NPMS achievement to standardisation, although most of them had linked the NPMS to the achievement of the organisation’s goals through the monthly monitoring of control item results.

Establishing a link between a standardised system and obtaining results

NSA had developed a standardised documented system to suit the requirements of the ISO9002 (1994) Quality Assurance Standard. A conceptual model of this Standard and how it links to the NPMS conceptual model is shown in Figure 1.

![Figure 1. Link between ISO 9002, NPMS and an Informal System. (Source: ISO)](image-url)

The model shows that the previous informal system was not structured in terms of defined policies or activities that were interrelated. It can be seen from the Figure 1. that both formal models have policies that are supported by standards but the NPMS model has, in between its policy and standards a Business Plan activity and measure interface. The achievement of goals through target setting is very much dependent on the ability of the process and how that process is managed, to achieve these targets. Wheeler (1993) says there are three ways to meet a goal:

- Improve the system
- Distort the system
- Distort the data

The processes used in implementing the NPMS in Japan are well embedded in the organisation as described in the eighteen hundred documented B90 Engineering department’s Standards. These Standards were developed by top engineers in order to improve the overall system and were designed to interrelate with each other. Ackoff (1994) said “The effect of any subset of parts on the system as a whole depends on the behaviour of at least one other subset” Kauffman (1980) states that a system “is a collection of parts which interact with each other to function as a whole.” It is possible, therefore, that the system may well be distorted if subsets act independently. The fear factor that may be leading to the distortion of data. So the comments of Wheeler (1993) become very valid in the NSA situation where many subsets are acting independently.

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Investigating Hoshins and Hoshin kanri

*Hoshin kanri* is a powerful planning tool and methodology utilised in Japan by many of its companies operating in international markets, such as South Africa. Often, overseas operations slightly vary the approach taken within *hoshins*, but according to Akao (1991), for the most part the approaches are uniform. The literal translation of *Hoshin* is from the Japanese “*Ho*” meaning methodology and “*Shin*” meaning compass. One type, the *Hoshin kanri* allows for breakthrough innovations and continuous improvement. In the process it also makes provision for a comprehensive communication system between all levels of employees. The communication has the objective of keeping all employees on track with what the company is trying to achieve. Each part of the NSA plant has its own objectives supported by specific goals. The idea is that all employees and at all levels in the hierarchy understand the strategic focus of the company and ideas on how to improve productivity are discussed between all employees.

*Hoshins* are also yearly statements of executive policy that include a context statement, as well as desired objectives and outlines of possible strategies to be achieved towards realising the objectives of an organisation as in the *hoshin kanri* as elucidated on above. They take precedence over any other aims and objectives or strategies to be employed. *Kanri*, which are the guidelines for operation, are developed at senior management levels and disseminated to the middle and lower managerial echelons for operationalization as well as further investigation and innovation relating to daily management tasks and routines for example, so that effective action plans and timetables can be put into action (Akao, 1991). *Kanri* makes reference to how *hoshins* are to be aligned and managed. Generally speaking, *hoshins* are utilised to achieve significant breakthroughs in areas where there is a worry that performance is not optimal. All employees pull together to realise the required breakthrough, usually in a company’s midterm plans, which takes priority. It is uncommon for more than six *hoshins* to be put into operation in any one year, but where a company faces challenges from competition in the marketplace, the number of *hoshins* may increase. Operational targets set are used as gradually increasing objectives to promote improvement in the relevant operational processes and to check on the principal business areas or control items so as to ensure they remain manageable. Managing *hoshins* and achieving daily targets makes it critical to have continuous improvement (or *kaizen*) in place. *Hoshin kanri* in particular can only be truly effective if executives are efficient and able to manage organisational learning through a fully cohesive system of feedback and review (Witcher, 2003). The management by objectives in Japanese organizations using *hoshin kanri* uses a framework of four sets of perspectives: “quality” (to alleviate customer concerns); “cost”, (cost effectiveness); “delivery”, (internal processes, creativity and logistics); and “education”, (human resource development, motivating employees staff and health and safety). There is thus a common framework for managing objectives company-wide and the outputs are reviewed daily. This is much in line with the balanced scorecard (Witcher & Chau, 2007). There is an annual cycle for *hoshin kanri* beginning with a review of the current status of the medium-term plan as it is carried out across the various Nissan companies. The review considers past performance and where the company stands at the present time especially with regard to core business areas. From about 2000 onwards, Nissan has been using three-year plans i.e. the NRP (Nissan Revival Plan), the Nissan-180 (where “1” represents an extra million sales, “8” an operating profit of 8 percent, and “0” zero automotive debt) and, more recently, the NV-up (Nissan Value-Up Plan) (Nissan, 2003).

In what is termed the ‘Nissan Way’, Nissan provides unique and innovative automotive products and offers a wide range of services that consistently deliver superior measurable values to all stakeholders who are in partnership with Renault. The ‘Nissan Way’ is essentially a corporate values statement on how Nissan manages its operations. According to Ghosn (2005b), it makes reference to the importance of cross-functional teams, stretch, empowerment and accountability. Also in line with what is termed the Nissan Way: "The power comes from inside", the central focus for NSA is the customer, the driving force is real value creation and the measurement of success is profits generated by the company. Critically important to Nissan is balancing profitable growth with sustainable development in which trust is built with all stakeholders, and in the process CSR initiatives are put in place which help in developing society in general.

![Figure 2: CRS Initiative](http://www.nissan-global.com/ENCOMPANY/CSRNISSAN/index.html)

(Source: [http://www.nissan-global.com/ENCOMPANY/CSRNISSAN/index.html](http://www.nissan-global.com/ENCOMPANY/CSRNISSAN/index.html))
Nissan’s vision is that the company becomes the leading auto-maker in terms of brand strength, quality, profitability and performance, globally and in every market segment. The strategic resources of Nissan are its tangible and intangible assets which when amalgamated aid in creating a firm’s strategic competitive advantage in which benefits and advantages of conducting business are clear (Teece, 2007).

What Nissan requires then is ethical conduct, diversity and transparent and strong corporate governance. Long term sustainable value in market in which the company is trusted is thus paramount (as in the above figure). It is important that employees are enabled to work in similar ways and to be able to communicate and support each other in all aspects of operation. Multi-skilled employees in a cross-functional work environment are vital to success where problems need to be addressed in a short time period and opportunities accessed when they are available (Ghosn, 2005a). Cross-functional working is key to the value-adding capability of Nissan. Certain critical areas and processes (13 in all) have to be managed effectively by all employees. These include **hoshin kanri**, basic daily management (*nichijo kanri*), production maintenance, standardization establishment, productivity improvement, inspection of production, production and logistics control, employee and labour management, cost management, quality control (JIT), engineering ability, localization of parts, and purchasing. **Hoshin kanri**’s inclusion stresses that the cross-functional processes of objective and strategic management must be managed by all Nissan’s employees.

An important aspect of **hoshin kanri** is that it allows executive managers to become more familiar with daily operational activities. They conduct top executive (*shindan*) audits (Nissan, 2003), which aim to provide an understanding of the way the core business processes and the improvement objectives are managed, in terms of both daily operational and strategic annual planning (Witcher, Chau, & Harding, 2008). Senior management teams utilize seven competences to audit the firm’s management proficiency in each of the 13 processes that are core to Nissan’s drive to consistently deliver and sustain quality value. How companies that are in alliance work together determines the levels of success that can be achieved (Bamford, Gomes-Casseres & Robinson, 2004).

Beamish & Lupton (2009), state that in managing joint ventures, a number of critical questions need to be addressed prior to alliance creation, namely: (a) Does the potential partner have the knowledge and experience needed to successfully conduct business, and are they willing to provide access to it?, (b) What are the candidate’s goals, and are we willing to assist in achieving them?, and (c) Is the alliance likely to be important for the local partner? Nissan and Renault undoubtedly spent a great deal of time thrashing out such issues. Which core competencies are indispensable to success is a primary question to deal with. They agreed on the following although at Renault they may have different terminology. The seven competencies include: daily control, working out of *hoshins*, coordination of *hoshins* and deployment for *hoshin* plans and control items, setting up of control items, analytical and problem solving, checking and taking action where required, leadership and participation by senior employees. In the audit the seven competences are termed diagnostic items (as per the diagram which follows)

![Figure 3. The NPMS Map (Source: Nissan South Africa)](image)

The above figure indicates how Nissan achieves quality and productivity improvement which is assisted through the use of benchmarked practices developed by engineers. The figure at the top represents daily management—this is the oval at the top and on the right. “**Gemba Kanri**”. This is in turn controlled by improvement activity linked to the medium-term plan, from which *hoshins* are originated through *hoshin kanri* to achieve the
breakthroughs that are required in order to remain competitive. The overlap of daily management (genba kanri) and hoshin kanri is also demonstrated in the figure NPMS Map (Nissan, 2003). Audits are shown as “Diagnosis”, within the hoshin kanri oval at the bottom right of figure 3.

The audit serves to confirm the status of both the hoshin kanri methods applied and the strategic objectives of the operation. The audit also compares how methods employed and results may improve in relation to the seven competences across all the companies units and ascertains how they are used in the 13 core cross-functional processes, and in general how these relate to Nissan’s vision and mission. Nissan seeks to facilitate a corporate-wide understanding of competence adeptness. Thus five scales are used, namely: “not aware” (stage one), “aware” (stage two), “starting” (stage three), “getting there” (stage four), and “arrived” (final stage). Competence is assessed against benchmarked standards specified by the engineering department at the head office in Japan. Senior managers walk about the plants and advise, mentor and discuss issues with employees on the floor. The set standards provide guidance to employees to assist them to arrive at the desired levels of competence. Through cross-functionality, the workers have greater opportunity to expand their job boundaries. The audits allow for solutions to be proposed and employees feel motivated to make greater attempts to implement real and meaningful change. Consensus is reached rather than compromise and it is clear that NSA is effective in capability since its executives are able to manage organizational learning through hoshin kanri and its effective feedback and review methodology (Witcher, 2003). NSA is prepared to sacrifice short-term financial results in order to invest for the long-term in superior quality which is what consumers seek.

Quality System Standard Documentation

If we accept that standardisation is important to achieve quality and productivity objectives, then we must establish how much of the system needs to be documented. One of the functions of the Business Systems Support department at NSA is to ensure that the organisation adheres to a formal documented quality system, as prescribed in the ISO 9002 (1994) Quality Assurance Standard. This department also has to ensure that each functional area meets its goals and Business Plan targets as laid down in the NPMS. It is generally believed by many organisations worldwide that there is only a need to document basic quality related standards when developing a formal system and other activities such as cost reduction or business improvement have no place for standards. Dale (1994) refers to these as ‘Level One Uncommitted Companies’. This belief may emanate from the popularity of the current ISO 9001 (1994) Quality Assurance Standard used by many organisations around the world. The ISO Standard 8402 (1986) Vocabulary for Quality Terms defines a quality system as. “The organisational structure, responsibilities, procedures, processes and resources for implementing quality management.”

The ISO 9001 (1994) Standardisation has in the past led to a stagnation of Quality Management Systems because of the lack of a specific clause requiring the continual improvement of the formal system. This situation was exacerbated because the main reason for introducing ISO 9001(1994) by many organisations was to stay on a customer’s preferred supplier list, not to use it as an improvement tool, as also quoted by Dale (1994). This situation should be rectified with the proposed introduction in November 2000 of an updated ISO 9001 (2000) Standard for Quality Management that required that ongoing improvement
and a Business Planning be in place. This new version of ISO 9001 follows the Deming (1982) application of the Shewhart PDCA cycle and was an attempt by the International Organisation for Standardisation (ISO) to succumb to pressure from world groups to align the ISO 9001 (2000) Standard to suit market requirements. It can be seen from figure 5 that the focus is on Customer Satisfaction. This is similar to the NPMS Map.

**ISO 9001 proposed update**

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**The Role of Communication**

If the introduction of standardisation and a common goal is to improve results then the content of these standards and the focused goal must be communicated to the entire workforce. It is also important to communicate with all levels and across all functions in the organisation if fear is to be eliminated and a constancy of purpose is to be created. Wickens (1987) cites six paragraphs from the Industrial Society’s (UK) “Charter for People at Work” which are stated as follows:

- The greatest challenge is co-operating with change – both technical and structural. All change must be supported by effective leadership from those accountable for involving people at every level.
- Views of people at work should be consistently sought and taken into account by management.
- To gain flexibility, commitment and the highest level of customer satisfaction and a sense of achievement we need to explain decisions and relevant business issues at regular intervals.
- We should take the lead in providing opportunities for individuals to contribute in the most appropriate way. Industry and commerce must in turn contribute to the community if it is to provide employment, resources and hope for the future.
- Individuals should be encouraged to participate fully in the activities of their trade union. Productive management – union relations should include the positive commitment from both parties to the aims and success of the enterprise and to the achievement of justice for the people involved.
- We should work to ensure that the whole community, especially the young, understands why the creation of wealth matters, both for future employment and for society as a whole.

Peter Wickens goes on to say that ‘if such philosophical statements are to be true to themselves then the team should develop them.’ Another British Motor industry mogul

Ray Horrocks ex-chairman and chief executive of British Leyland quoted in Wild (1982) Says: “The perfect management structure would appear to be businesses run singlehandedly and which by definition, involves unanimous decision-taking, instant communication and the shortest, most direct chain of accountability…!”

The Japanese see this communication role as important and have created various forums to discuss and display results and communicate improvement activities. These communication forums take place from green area meetings at shop floor level to Operations meetings at senior executive level.
The NPMS Interrelationships across Divisions

Each division has an interrelationship in the system with all the others. This series of interrelationships is depicted in figure 6, System Thinking Interrelationships, where it can be seen that each part interacts with other parts to contribute to the whole system.

![System Thinking Interrelationships](image)

Figure 6. System Thinking Interrelationships

The above Figure 2.3 shows a number of parts interacting with each other to form a whole system. In the case of Nissan South Africa these parts illustrate the departments or divisions or even various tasks, processes or business plan targets that cut across divisions. Ackoff R (1994) emphasises that individual parts when taken away from the whole have little or no substance. The NPMS attempts to bring these divisions together by bridging the three pillars of the organisation, that is design / development, production engineering and shop floor by team kaizen improvement as shown in figure 3.

The NPMS and the Viable Systems Model

One of the main attributes of a Viable Systems Model (VSM) as described by Beer (1985) is its ability to deal with dynamic feedback and variety. The NPMS is very prescriptive in its nature both in implementation to a rigid methodology and its support standards of proven best practices of the source company. It can be argued that by comprehensively documenting a management system, variety is reduced and is replaced by consistency.

Kauffman (1985) states, “It is much simpler for a society to have one basic set of rules which apply to all families.” This could give justification to the NML head office promoting a Nissan world standard for quality and productivity improvement. So the challenge to the organisation is to satisfy the requirements of NPMS and maintain its viability in terms of Stafford Beer’s VSM. Feedback loops from the numerous audits of the system are relatively slow and generally only occur following the discovery of nonachievement to the targets set following an internal audit based on a static Business Plan or prescribed standard method. A VSM allows for greater complexity and variety to be dealt with in a far more dynamic manner. This can be taken further in terms of predicting outcomes based on external environment dynamics. This is mainly possible because of the nature of a VSM to be self-organising, as it is able to meet with dynamic external conditions. If a narrow view is taken of the Hoshin Kanri deployment method, then it only covers those elements of the manufacturing process that effect the “Business Plans” that have been established through the introduction of specific Control Items. The NPMS is not in itself a complete system, but it does have a place in the context of a broader Viable Systems Model. However, the NPMS takes a broad view and not only looks at tasks and responsibilities, as for instance the ISO 9002 Standard (1994) does, but also incorporates ongoing performance measurement. In the quest to ensure strong interrelationships between functions and hierarchies, there is a similarity between the NPMS and the VSM as discussed by Clemson (1984). Systems thinking and a subsequent approach to interrelationships have contributed to the development of the VSM. The VSM model within NSA, shows a number of parts interacting together to produce the whole in the context of Hoshin Kanri. The VSM structures these parts in a particular way and operates in an external environment and allows for feedback from that environment. This external environment now has to take cognisance of the Renault, Nissan Global alliance and the cultural challenges this presents.
acknowledges this and gives the example of management saying, “This is what we want done. Please figure out how to do it and then do it”. The daily management activities are being attenuated and basically left alone by management they are often only interested in what is contained in the Business Plan. In the case of NSA there is a strong external systems influence from NML in Japan.

The aforementioned merger of Nissan and the Renault Company in France has further complicated this with an external financial influence. The financial targets being set by head office are impacting on cost saving through reduced headcount but the complexity of the operation remains the same. The NPMS also attempts to use its different parts in such a way as to handle the most complex and variable internal situations. A VSM of an effective organisation facilitates the process of control as well as communication between levels and across functions. The concept of the customer is the next chain in the process is shown in the feedback loops of each S1 function. In this case the target of one function is linked directly or indirectly to the target of another function. The outflow of defects from one area to another e.g. body shop to paint shop is seen to be a focus of action by the Japanese. However, the focus is on a numerical figure to meet a benchmark rather than the actual process variation itself. The Japanese EVP sees the task of alignment of the system across functions by the managers themselves as important and by opening up channels of communication the defects generated can be greatly reduced. The NPMS department’s audit is seen as secondary by the Japanese or even as an infringement of the duties of the S3 function. Their objective is that each manager takes full responsibility for each aspect of his own department and should not rely on an external audit or facilitator to carry out this function. This role is now becoming more directional in line with that of an S4 function in terms of aligning policy and giving broad business direction. The S5 function is looking at the Hoshin Kanri policy of the organisation as required to satisfy the customer and use as a base to set the corporate business objectives. One of the S4 functions is that of the Business Plan review and the Executive Vice President is using his Top Shindan audit function to review performance on a personal basis.

A Management review committee to oversee the adherence to ISO 9002 (1994) is still in place and this committee must verify that the quality management system as implemented and maintained is effective and is satisfying the policy, goals and objectives of the organisation. This S4 role is now shared with the Senior Manager of the Business Systems Support department who now also oversees and reports the Business Plan objective results for the entire company to the parent company in Japan. The S3 function is the control function, which ensures that standards and procedures are implemented and maintained as per the requirements of the Business Plan objectives. This function also has to update and report on a monthly basis Business Plan performance by each area manager to his Vice President. The S2 function has been limited to the facilitation function of ensuring that each activity is interacting to enable the overall company targets to be met. S1 shows the areas within NSA that are subject to shop floor improvement initiatives and feedback information on non-conformities to and from each other. Each area has its own goal set for QCD target achievement that is monitored daily and reported monthly. If the NPMS is to operate effectively as an efficient global management tool there needs to be consensus and synchronization in all functions in NSA to be able to achieve the desired objectives. Equilibrium is required in NSA to guarantee that any systemic modification brought about in order to accommodate the dynamic needs of individual employees must be adjusted to the requirements of the customer and the broader needs of the system. Any corrective and/or preventive actions are determined and generally implemented in such a way as to keep the goals and objectives of all the divisions in the company workable while still meeting the group targets of the organisation.

Comparing Benchmarks
A webstyle benchmarking is carried out by NSA with plants in Japan, France, Taiwan, Mexico, the United States, China, Thailand, Spain and the United Kingdom. Significantly, in 2003, production in Nissan’s overseas plants surpassed the 50% overall Nissan production and is a continuing trend. Through a standardised approach of measurement and by using the principles of the NPMS step up method, each overseas plant can be measured and Benchmarks set up as ‘best in class’ by category. The senior manager of the B90 Engineering division at NML established the measurement of each Company by using the Standard NPMS step up diagnosis questionnaire. The Yulon Motors plant in Taiwan was promoted, by NML, as the Benchmark for NSA. This operation has a similar model mix and their volumes are also compatible with NSA. In October 1998 data was collected from each overseas plant and a comparison was made of the level of NPMS step up achievement scores and compiled into the matrix shown in Table 1.Benchmarks of NPMS Diagnosis results.

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<th>Function</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
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<td>4</td>
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<tr>
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<td>3.8</td>
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<tr>
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<td>4</td>
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The above table shows a comparison of the levels of achievement of the NPMS functions by each overseas Nissan operation and each NPMS key activity. As can be seen, NSA has a low level of achievement compared to the other operations. In this analysis a score of one is interpreted as basic and a score of five is interpreted as being fully competent. The NPMS Matrix indicates the correlation of these functional step-up scores with actual performance of QCD objectives. NPMS introduction timing, shows the progress made by each of these overseas plants since 1993 and the step up score achieved. It can be seen that the Yulon plant in Taiwan and the NPMI plant in Malaysia started the programme a year before NSA. Step up results had good correlation with each plant’s performance in terms of Quality and Delivery performance.

The Deming Influence as the Foundation for the NPMS

Harding (1999) recognised that the NPMS as a system, links it to the W. Edwards Deming philosophy. Deming (1993) states: “the first step is clarification; everyone in the organisation must understand the aim of the system, and how to direct his efforts toward it.” This is covered in the NPMS by the Hoshin Kanri process of policy deployment. Deming goes on to say: “Everyone must understand the danger and loss to the whole organisation from a team that seeks to become a selfish, independent, profit centre.” It is this Deming principle that is the main driver of the Hoshin Kanri element of the NPMS. We have discussed earlier in this chapter about creating harmony so all parts of the Company can focus towards a common goal. The Hoshin Kanri plan is the vehicle to be used to ensure this principle of harmonisation is applied. The new Executive Vice President of NSA has started this process of alignment of focus through his Top Shindan audits, which is not only checking the targeted result but also how each objective is supporting the overall Company’s targets.

The Importance of Deming’s First and Eighth Point

Deming’s (1982) first point says: “Create constancy of purpose for continual improvement of product and service.” Deming’s initial point calls for long-term thinking and planning by managers at all levels to promote a clear vision of the firm, its customers, its method for delivering value to its customers and the role of quality in that method. Managers must also ensure that employees understand this vision and move continuously toward it. The Nissan Plant Management System through the Hoshin Kanri policy deployment process as well as its call for clear indications of objectives and measures covers this, the first of Deming’s 14 points. This point also calls for harmony in that everyone must share the constancy of purpose across the organisation. Finally, this point calls for managers to focus attention sharply on long term efforts to reduce unnecessary variance in their Operations Management system.

Deming’s eighth point is to “Drive out fear.” Deming identified fear as a major obstacle to improved efficiency and effectiveness and a major barrier to change and survival. Although Deming focused his ideology on the shop floor, the same fear can manifest itself in senior management as discussed in chapter one. Fear affects an Operations Management system in many ways. Some people are afraid to ask questions and reveal weaknesses in their knowledge; other people fear co-operating because it may lead to failure, such as poor performance reviews or even termination thus preventing some people from challenging current practices or trying new techniques. The foundation of the NPMS map states that it is essential to establish the suitable atmosphere, making the organisation energetic. The NPMS further requests that the organisation renovates the old stereotype to dispel these fears. All management does not share this ideology of Deming (1982).

Wild (1982) quotes Hendrik Sloet the then Managing Director of Saambou National Building Society of South Africa as follows: “To be a good manager one must be a strong manager. Thus he must have discipline and his staff must fear him to a degree. However, it must be fear that is inspired by respect and not the result of irrational or inconsiderate behaviour.” This idea of fear linked to respect seems to manifest itself in the Afrikaans management of NSA and it is interesting that this statement comes from an executive of an Afrikaans organisation. The Japanese management advisors at Nissan prefer to say that to drive out fear, managers must create an environment that encourages people to ask questions, report problems, and try new ideas through Kaizen improvement. Employees must know that the firm will not punish them if new ideas fail. Managers must demonstrate the importance of trying something new that offers a chance for a major leap in effectiveness.
rather than sticking with safe methods that offer only stable or declining benefits.

The Need to focus on Consistency
Although Deming (1982) refers to Constancy of Purpose, in terms of a single focused objective, it is important to the Japanese to be consistent. It is difficult to improve a process that is out of control; so therefore, any variation in a process needs to be controlled. The first objective is to focus on the consistency of the task being performed. The first step to meet this objective through the NPMS is to standardise the process through the development of procedures or work instructions. The degree of documentation developed is dependant on the nature of the task and the skill and experience of the person performing the task. This is why the Japanese spend a lot of time and effort evaluating the task as well as the skill level of the operator. At the higher level in the organisation consistency comes through the development of the Hoshin Kanri policy deployment activity. This methodology is aimed at being consistent in target setting and achievement, not just in the target set but also in the overall effectiveness to the organisation. The NPMS prescribes a consistent approach to achieve quality and productivity improvements by utilising the various B90 Standards. Constancy of Purpose at NSA can be summarised as a focused approach by all levels in the company to bring the operating system under control by the application of the Standard Way of daily management. Once under control then Hoshin Kanri can be used to gain the improvements necessary to remain competitive. At shop floor level, once the operating system is under control, improvements can be made through Kaizen or gradual small improvements.

The Need to Drive out Fear
Deming (1982) explained that fear is an obstacle to improving efficiency and effectiveness. Neither an operator nor a senior executive will perform at their best if they are fearful of making a mistake or making a wrong decision. If NSA is to adopt a new strategy for success, then fear of failure must be driven out. Senior management must not fear reprisal for reporting bad news. Shop floor workers must not fear disciplinary action against them for not performing to a standard that they were not trained to achieve. A culture needs to be developed where everyone in the organisation can listen to each other and openly discuss concerns and collectively offer viable solutions. In order for this to happen, sound personnel management principles must be adopted as prescribed in the NPMS map. A change of understanding about the meaning of discipline needs to take place. Discipline within the Deming philosophy refers to self-discipline of each individual to work consistently to a common objective through standard work methods.

How does Deming’s remaining 12 points fit into the NPMS?
We will now look at Deming’s remaining twelve points as adapted by Melnyk and Denzler (1996):
1. Adopt the new philosophy for economic stability.
2. Cease dependency on inspection to achieve quality.
3. End the practice of awarding business on price tag alone.
4. Improve constantly and forever the system of production and service.
5. Institute training on the job.
6. Adopt and institute modern methods of supervision and leadership.
7. Break down barriers between departments and individuals.
8. Eliminate the use of slogans, posters, and exhortations.
9. Eliminate work standards and numerical quotas.
10. Institute a vigorous program of education and retraining.
11. Institute a vigorous program of education and retraining.
12. Institute a vigorous program of education and retraining.

In essence all of W.E. Deming’s points, according to Harding (1999), have been adopted for use within the framework of the NPMS with the exception of point ten. This point says avoid using posters and slogans. The Japanese parent Company at Nissan very much believes in the use of slogans. In support of the NML Company they do use the slogans after providing resources to the operator to improve his performance. Deming (1982) was probably making the statement in this point that slogans alone will not improve performance. We can derive from this analysis that the NPMS is very much based on Deming principles as concluded by Harding (1999).

Deming’s Theory of Knowledge as a support for the NPMS
Deming (1993) stated that without theory there can be no learning. Goolsby interprets this as; that to be valuable our experiences must occur in a structured environment that is conducive to learning and is capable of putting meaning to our experience. The Nissan Plant Management System gives just that structure to the entire vehicle manufacturing process and offers a broad learning opportunity through all levels. The eighteen hundred B90 Standards give the foundation to begin enhancing the learning process, but the actual Shop floor gives the platform to put meaning to that experience. Deming (1993) said: “The prevailing style of management must undergo transformation. A system cannot understand itself. The transformation requires a view from outside.” This was a view that Deming referred to as a System of Profound Knowledge. This provided a map of theory by which to understand the organisation that
we work in. The first step then is to transform the individual. The individual transformed will perceive new meaning to his life, to events, to numbers and to interactions between people.

**Introduction to Deming’s System of Profound Knowledge**

Deming listed four parts to the layout of Profound Knowledge and indicated that they all related to each other. This layout can be used to ascertain the NPMS relationship with each of the attributes that Deming postulated that managers need to have. Managers and employees must transform but are required to understand what is termed The System of Profound Knowledge, which consists of four parts:

1. **Appreciation of a system**: this means employees understand the overall processes involving suppliers, producers, and customers (or recipients) of goods and services;
2. **Knowledge of variation**: Employees are well versed in the range and causes of variation in the quality of what they are producing, and the use of statistical sampling in measurements;
3. **Theory of knowledge**: the concepts explaining knowledge are understood and the limits of what can be known are ascertained;
4. **Knowledge of psychology**: The various concepts of human nature are clearly understood.

**Transformation of Management’s Appreciation for a System**

Dr. W. Edwards Deming (1993) stated that the prevailing style of management must undergo transformation and that a system cannot understand itself. This transformation of management was necessary in order for the NPMS to work effectively in NSA. The previous management of NSA were only reporting the good news at executive operations meetings. As Deming (1993) stated in the New Economics “An individual may seek to cast a halo around himself,” reporting to the MD what the MD wants to hear. Management needs to understand the broad principles of the NPMS. They could not report that the system was working well and in place if the data being reported indicated something different. Each manager needed to know whether his function was operating effectively within the broad system requirements of the NPMS. This understanding needed to be established through the NPMS step up diagnosis that had been predetermined by the Japanese. The diagnosis score was an easy reference for each manager to know how he was doing as part of the broad system. The diagnosis method had been set up to balance the system. If the results of the system were on track, then the performance results should also be on track. If the two results did not balance in terms of performance results, than some self-analysis was necessary. Japanese manufacturers such as Nissan, place great emphasis on quality improvement and this has been the case since the visit of Dr. Deming. Consequently, Japan is viewed as the worldwide symbol of quality. Japanese manufacturers achieve defects that are hardly measurable, possibly as low as 3.4 defective parts per million. Such incredible quality of production can be attributed to variables such as highly effective worker training and total employee involvement as well as companywide delegation of authority and responsibility for quality issues.

Richard Schonberger in his book "Japanese Manufacturing Techniques: Nine Hidden Lessons in Simplicity", presents nine “lessons” the world should learn from Japan, namely:

1. Management technology is a highly transportable technology.
2. Just-in-time (JIT) production exposes problems otherwise hidden by excess inventories and staff.
3. Quality begins with production, and requires a company-wide “habit of improvement.”
4. Culture is no obstacle; techniques can change behavior.
5. Simplify, and goods will flow like water.
6. Flexibility opens doors.
7. Travel light and make numerous trips, like the water beetle.
8. More self-improvement, fewer programs, less specialist intervention.
9. Simplicity is the natural state.

Just-in-time (JIT) production is also a very important aspect of waste elimination. It is often defined as the elimination of waste. JIT is thus the production of precisely the necessary units in the correct quantities at the right time in order to maintain perfect performance to meet required schedules. Over production is counter-productive.

**Educating the Shop Floor on Appreciation of a System**

Generally speaking, a system such as the NPMS, is a collection of parts or subsystems which are integrated to accomplish the overall goal in an organization. Systems thus have inputs, processes, outputs and outcomes. It is imperative to have ongoing feedback among the various linkages in a system. Consequently, if one part of the system is removed, the nature of the system is drastically altered. The various parts of the organization, and, in particular, the interrelations of the parts, e.g., the coordination of all production units with other relevant stakeholder departments, engineering with manufacturing and production, supervisors with workers, etc. must all be in sync. Attention is placed on ongoing organization of work teams and production and feedback.
Managers and employees diagnose the problems, but by recognizing larger patterns of interactions and how these interrelate. Managers and worker teams maintain perspective by focusing on the outcomes they want to achieve in the NPMS. It is thus vital that managers proactively focus on structures that aggravate negative behaviours and outcomes that determine events, rather than reactively trying to mend disasters in production and that employees have buy-in. The NPMS can also be interpreted as an organisational learning tool towards the appreciation of a system, in that it encourages the participation at all levels in developing sound working interrelated practices. These practices can then be taught to various levels and functions. This can then be used as the foundation of future plans for further system development. Van der Heijden (1997) refers to a traditional “common sense” approach to an operational system and lists the following bullet points:

* An acknowledgement of aims, either through an external mandate or the organismic purpose of survival and development.
* Assessment of the organisation’s characteristics, including its capability to change.
* Assessment of the environment, current and future.
* Assessment of the fit between the two.
* Development of policies and, following from this, decisions and actions to improve the fit.

At shop floor level this is difficult to understand. To the operator his system is usually limited to his immediate task that he is performing in line with his Standard Operation Sheet. In some cases at NSA an operator would have been performing the same task for twenty years without knowing what was happening up or down stream. So it is difficult to enable the operator to appreciate a system. By multi-skilling an operator through the provision of on the job and off the job training and introducing basic maintenance tasks, NSA are attempting to broaden the operators appreciation for the broader system. At foreman level this is taken much further through the training to the six basic training modules. The idea of this broad training is to allow the foreman to move from pure supervisor to mentor and coach and also improve the operator’s awareness of the broader system. Just as the operator has little knowledge of the broader environment in which he works, management also have little knowledge of the total environment of each operator. If management do not understand the total process they cannot understand the variation emanating from that process.

**Enhancing Management’s Knowledge of Variation**

In order for management to appreciate shop floor conditions, it is important that they are aware of the variation in any process and what those root causes of

variation are. Wheeler (1993) states, “We live in the information age and much of that information comes to us in the form of numbers… Unfortunately, much of the data reported to executives today are aggregated and summed over so many different operating units and processes that they cannot be said to have any context except a historical one – they were all collected during the same period.” He goes on to say, “Before information can be useful it must be analysed, interpreted and assimilated.” Deming’s (1982) fifth point says, “we must improve constantly and forever the system of production and service”.

But before the system can be improved, management must first understand that system, so that the necessary improvements can be made.

**Empowering the Operator and Increasing His Knowledge**

Deming (1982) focused his twelfth and thirteenth point on removing barriers that rob the hourly worker of the right to pride in workmanship and instituting a vigorous programme of education and training. In order for the hourly worker to have pride in his work, he must be empowered to perform to the best of his ability. Sometimes this will necessitate that he is given the responsibility and authority to improve his own job through his own understanding of the process. The operator has the specialised knowledge of the day-to-day operation and management often ignores this knowledge. This knowledge must be utilised in terms of involving the operator when introducing new facilities or work methods. It is the task of management, therefore, to ensure that the operator is educated and trained not only in the skills of his direct task but also in the broad environment in which the task is performed.

**The role of Kanbans**

Japanese firms such as Nissan employ self-regulating system techniques (*kanban*) for production control. Specially selected containers are used and it also recycles traveling requisitions to standardize the system. The right to produce or supply parts, for example, emanates from operations which are further downstream. Various quality control techniques are also in place to ensure that quality is maintained and indeed maximized while efforts are made to reduce waste. The techniques used include *jidoka*, *bakayoke*, and *poka-yoke*. *Jidoka* is a quality concept meaning "stop everything” when errors are identified. It thus controls quality issues at their source. Employees become their own watchdog and assume responsibility for their outputs. If an error is uncovered, the employee stops the production process by pressing buttons and shutting down mechanisms. Bell ring and lights flash and the problem is identified. Inspections are also carried out machines called *Bakayokes* that are attached to
machines to automatically determine if an error has occurred in the production process. This includes machine maintenance issues, or warnings when stress and tolerance levels of machines are in danger of being exceeded. In the process of manual assembly, poka-yoke or mistake proofing is used by employees.

The Green Area Challenge and Psychology

A “Green Area” is a location where a unit of workers meets each morning prior to the start of shift under the leadership of the area foreman. This is part of the Genba Kanri system and is used in Japan for communicating performance expectations and assessing the previous day’s performance. To the Japanese culture this is quite acceptable with each worker having respect for his supervisor. In South Africa there is a psychological barrier to be overcome before this practice is fully implemented. The foreman is still seen by the operator as a voice of management to exert pressure on the workforce to meet management’s objectives. The NSA workforce does not yet accept the voluntary methodology of C and J (challenge and practice). Management’s challenge in the future must be to embrace this concept of giving ownership of improvement to each operator and allow him to meet his own target. The Green area is not yet seen as the communication forum where operator and Foreman exchange ideas and challenge the targets for improvement.

CONCLUSION

There is a distinct relationship between various production and support systems in a manufacturing environment such as NSA and the results that are ultimately achieved. Nissan South Africa has made excellent use of the NPMS as an improvement tool and it is undoubtedly vital to strategic team performance management which implies an interrelationship and proficient management of both the top and low level strategy, as well as operational teams, and the performance of employees. This is critical for transforming an organization’s ability to manage change effectively and to improve the bottom-line.

When evaluating the NPMS as a global improvement tool The Nissan Plant Management System appears to be a sound framework for introducing quality and productivity improvement with a focus on waste elimination and customer satisfaction. The basis for the system appears to be twofold. Firstly it relies on a standardised approach and discipline must be in place to consistently work to those standards, which form the basis of the system. The system is very prescriptive in its methods and application criteria and is far more comprehensive than the basic requirements of the ISO 9001 (1994) version of a Quality Management Standard. Secondly the Nissan Way demands that the organisation cover all the human resource and softer issues that Wickens (1987) says must be in place prior to introducing a Japanese philosophy. This aspect of the NSA operation needs to receive much more attention if it is to compete on an International basis. The NPMS supports most of the principles of WE Deming (1982) described in his work “Out of the Crisis”. In fact, Harding (1999) concluded that the NPMS had its origins from Deming’s teachings. It also strongly relies on a motivated and knowledgeable workforce that is prepared to work in a disciplined and harmonious manner.

The control of the system must come from the foreman who is able to play a leadership role in ensuring that management’s targets are met through the principle of Challenge and Practice and at the same time ensure that the workforce are willingly working towards improvement goals. It is imperative that the foundations of sound personnel management principles, which drive out fear from the organisation are laid prior to more demanding pressure being exerted on the workforce and management for improvement. The merits of using the NPMS in Nissan plants worldwide have been indicated by the fact that it is a proven system that has worked well for Nissan operations in Japan, Europe and North America where productivity levels have achieved results three times that of South Africa. (Source, Nissan Global Report)

There is no guarantee that the system will have the same result if used in South Africa. The advantage of the system is that it is supported by many best practices that have been proven to work in Japan. The demerits of the NPMS are that it relies heavily on the self-discipline of each function to work to a standardised method. Nissan South Africa has not yet been able to demonstrate that it can achieve a level of four points, which is the implementation standard as required by the system administrators from Japan.

The key to the introduction process is the level of acceptance at the shop floor that is measured by Genba Kanri step up achievement. The benchmarks indicate that South Africa has the lowest score of GK introduction when compared to other overseas Nissan plants. Hoshin kanri is clearly an excellent innovation which is utilized fully at Nissan at the senior level to develop and align its business methodologies and management philosophies as core competences. The great success of Japanese management techniques such as the NPMS and the role of hoshins in this success should generally serve as an example to companies who are serious about quality outputs. Such innovative techniques can and should be applied to many industries. In a continual modality of quality improvement, workers are given both the authority and responsibility to enhance their performance. The ongoing improvement through the use of kaizen, JIT, and Total Quality Management is indeed noteworthy but can only be effective in
countries where the work ethic is strong, failing which it may leave employees feeling burnt-out for scant financial reward. Consumers still demonstrate their belief in Japanese goods by purchasing what they see as good quality products at a fair market price. Given the belief in Japanese goods that the South Africa motor vehicle market displays, Nissan and indeed NSA, has a strategic competitive advantage and its position within the market should steadily improve.

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