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## Corporate Innovation Online

Nucor's big innovation was technology but equally important was its culture brought about in small and big steps.

This Profile was originally published in 2009 but has been reformatted.

Nucor, in comparison to other innovative companies profiled, is a relatively new company with Iverson's regime beginning in 1962. Four leaders have contributed to the company's culture; Iverson, Correnti, Aycock and currently DiMicco.

Since corporate cultures evolve over time, this Profile attempts to examine the contribution from each leader. No doubt Iverson brought new technology – the mini-mill into the moribund steel industry in the U.S. but the focus here is on Nucor's policies and management practices. 'It's a culture built in part with symbolic gestures'.

Nucor also has an innovative tradition when it comes to managerial practices. Largely due to Iverson's philosophy, practices were very different from traditional steel industry practice. A summary of these innovative management practices would include: minimal hierarchy, head office staff at a minimum, pay based on performance with the senior executives having the highest portion of compensation at risk, low wage coupled with big bonus for meeting or exceeding production targets, risk assumption, no perks, etc. Many more detailed in this Profile.

Beyond this, Nucor chose its sites in rural America, wishing to accommodate the local work ethic and allow people to remain in their own community and be paid above normal. A higher vision!

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This Profile is based on an examination of several publically-available sources.

- The Nucor Story, Nucor Corporation web site.
  - 2009 Nucor Annual Meeting Presentation.
  - Annual Report, 2008.
  - Press Releases since 1998.
  - New Yorker, The Annals of Enterprise by Richard Preston, February 21, and March 4, 1991.
  - Nucor Corp. and the U.S. Steel Industry, Boyd and Grove, 2000.
  - Case Analysis, Nucor Corporation, Company and Industry Analysis, Johnson, 2008, BUSA 490, Capstone.
- Attribution is provided by the addition of footnotes.

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## Executive Overview

There is a positive correlation, i.e. Nucor practices fit well, with 18 of the 25 Factors deemed to describe a culture which supports (or detracts from) innovation. [We go on, after the non-correlated Factors, to set out a full range of very positive attributes – policies and management practices – which have contributed to Nucor's reputation as an innovative company]<sup>1</sup>.

On the other hand, several of Nucor's management practices are not similar to other innovative companies and these differences are highlighted below. There is, however, little if any correlation with the practices of other innovative companies for the following 5 Factors.

### **Factor #3; Tolerance of mavericks.**

There is little reference to the role of mavericks per se in the innovative process. This is in contrast to a number of other innovative companies where it is often stated that mavericks play a key role in the innovative process. Innovative companies often make special mention of the role of mavericks. On the other hand, the company's web site makes reference to Nucor's 'Unconventional Thinking' and provides six examples.

### **Factor #7; Use of career ladders and recognition of innovators and the related Factor #14; Availability of reward mechanisms for innovation.**

While other innovative companies have a number of monetary and non-monetary (awards, honors, etc.) rewards dedicated to innovators, this is not the case in Nucor. Companies such as 3M and John Deere single out innovators for recognition and rewards. Nucor does not but prefers to reward group performance to the exclusion of recognizing individual excellence.

### **Factor #17; Management expectations regarding loyalty to the company versus personal development.**

Nucor places emphasis on group performance and the focus is on safety, quality, cost and financial performance. There is little sense that the company provides any company time for personal development – and this may not even be relevant in this industry. Other companies such as Google and 3M have enunciated a position on the use of personal time when on company time, Nucor does not have an articulated policy on this issue.

### **Factor #23:R&D versus the competition.**

Nucor makes the point that it does not have an R&D department nor does it engage in does it engage in R&D; certainly not the 'R' portion. Nucor is an adapter of technologies developed elsewhere but often proven by Nucor in some form of joint ventures or shared-risk arrangements.

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<sup>1</sup> Comment added on reformatting as of May 9, 2014, since the original Profile structure, in our opinion, was too negative at the start.

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Nucor does not have the reputation for conducting research into steel processes nor in new product development. Nor does it covet such a reputation.

Should more information become available (and contributions through the web-site blog are encouraged), this could add to or subtract from this correlation.

## Brief Background on Nucor

Iverson, quite properly, is given the credit for getting Nucor off the ground, for establishing its culture, and for the company's early development. He had a management philosophy and he had access to a technology that was about to take off; i.e. electric mini-mills. It is stated that he did for mini-mills what Andrew Carnegie did for integrated mills<sup>23</sup>.

Iverson is quoted as saying that there are two most fascinating sights in the world; one was to 'behold hot metal in motion' and the second was to watch 'a group of people in the headlong pursuit of a shared purpose'<sup>4</sup>. He notes that these are 'the essence of Nucor'. If there ever was a passion for the steel industry, it could not have been better stated. For those who have not visited a steel plant, whether an integrated or mini-mill, it is an experience and it is impressive. Obviously Iverson was passionate about the steel industry and all that it represented except, of course, for the then in-place management culture of the integrated mills. He abhorred their culture.

Ken Iverson, CEO of Nucor joined a company called Nuclear Corporation of America as Vice President running the Vulcraft Division. He became President in 1965 and the company changed its name to Nucor in 1972. Nucor became the largest steel producer in the U.S. by 1999 which also marked the end of Iverson's tenure. Nucor has further developed under successive management and is now the largest steel company in the U.S.A. with a growing presence internationally.

A time line for the development of Nucor, and its culture, might highlight the following key events.

- 1955 Near demise of Reo Motor Car Company leads to first publicly traded nuclear company.
- 1962 Iverson joins Nuclear Corporation of America to run its Vulcraft Division.
- 1965 Iverson is appointed President.
- 1966 F. Kenneth Iverson pins hope for the company's survival on metal fabrication operation.
- 1968 Mini mill steel production plans set in motion.
- 1972 Company is renamed Nucor Corporation.
- 1974 Fatal accident leads to policies benefiting employee families. 2<sup>nd</sup> mini-mill established in Norfolk, Nebraska.
- 1975 3<sup>rd</sup> mini-mill established in Jewett, Texas.
- 1979 Company begins cold-finished bars manufacturing.
- 1980 4<sup>th</sup> mini-mill established in Plymouth, Utah.

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<sup>2</sup> According to DiMicco

<sup>3</sup> Nucor Corporation, Iverson.

<sup>4</sup> Nucor Corporation, Chapter 3, Culture.

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- 1984 Aycock assumes role of COO.
- 1986 Nucor embarks on effort to bring mini-mill into costly sheet steel market.
- 1987 Crawfordsville start up; the 1<sup>st</sup> mini-mill for Nucor.
- 1989 First thin slab production.
- 1990 Loss of life drives renewed safety effort by company.
- 1992 Aycock leaves management but continues as a director.
- 1995 Despite looming uptick in industry capacity, Nucor continues aggressive growth drive. Iverson steps down from day-to-day operations.
- 1996 Correnti assumes role of CEO and Iverson stays on as Chairman.
- 1999 Iverson, as Chairman, is forced out. Company weathers management breakup. Aycock returns as Chairman and later CEO.
- 2000 Dan DiMicco elected President and Chief Executive Officer succeeding D. Aycock.. Brown is appointed Chairman of the Board succeeding D. Aycock.
- 2002 Dan DiMicco assumes office, ultra-thin-cast steel produced at Crawfordsville. Nucor acquires Birmingham Steel Corporation (Correnti had been at the helm since 1999). Iverson dies at 76.
- 2005 HIsmelt joint venture (which eliminates the need for coke production and is designed to produce high-quality pig iron and at the same time reduce Nucor's carbon foot print).
- 2007 \$2.3 billion in revenue, 22.1 million tons of steel, and the 139<sup>th</sup> consecutive dividend.
- 2009 January - 2<sup>nd</sup> 'Caststrip' facility in Blytheville, Arkansas.

By the mid-1990s, it was clear that Nucor was on its way, using a combination of new technology, a management philosophy, and an attitude to risk to which the integrated mills could not respond. The advent of the mini mill was the main driver.

In an industry as Rust Belt as they come, Nucor has nurtured one of the most dynamic and engaged work forces around. One of the characteristics of Nucor was that nonunion employees at the Charlotte (N.C.) company didn't see themselves as worker bees waiting for instructions from above. Nucor's flattened hierarchy emphasized pushing power to the front line lead its employees so they would adopt the mindset of owner-operators<sup>5</sup>.

At Nucor the art of motivation, according to DiMicco, is about an unblinking focus on the people on the front line of the business. It's about talking to them, listening to them, taking a risk on their ideas, and accepting the occasional failure. It's a culture built in part with symbolic gestures. Every year, for example, every single employee's name goes on the cover of the annual report. And, like Iverson before him, DiMicco flies commercial, manages without an executive parking space, and really does make the coffee in the office when he takes the last cup.

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<sup>5</sup> Business Week; The Art of Motivation, May 1, 2006.

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## Nucor's Culture

How important is the corporate culture<sup>6</sup> to Nucor's success? Management points out that their advantage does not stem solely from proprietary technology. After all, most of their innovations, including thin-slab casting and the use of iron carbide, are based on technology initiated by other organizations.

Nucor, at the time of its inception, represented a unique difference, a sharp contrast, with the culture associated with other steel mills and conglomerates both in the U.S.A. and throughout the world. One visitor from an integrated producer commented that at his plant the culture is adversarial, management versus employee, with no trust between the parties; 'us' versus them refers to workers versus management and production. In contrast, at Nucor workers are seen striving together as a team, helping each other, and working toward a common goal – the production of a high volume of low-cost, high quality steel. An integrated mill employee making reference to the difference between the integrated mills and Nucor stated that the difference is the culture. Nucor's culture is a throwback to the agrarian idea that if all the farmers work hard and help each other, they can collectively survive and meet with success. Our culture is one of aggression, confrontation, and lack of trust<sup>7</sup>. The company is now working hard to maintain a spirit of innovativeness as it has become much bigger in terms of people, production, and product complexity.

Iverson explained Nucor's success as being based on a combination of the technology selected by management and the culture of the organization. He was unsure if technology was 20, or 30, or even 40 percent – but he was sure it's less than half of the formula for Nucor's achievements. The culture that Nucor instills is focused primarily on the long-term health of the organization. For example, debt is avoided, start-up costs are not capitalized but rather are expensed in the current fiscal period, and depreciation and write-offs lean towards the detriment of short-term earnings. Iverson was adamant about not bowing to short-term pressures to manage earnings or spread dividends evenly over a quarterly basis. He refused to do it. He compared companies that try endlessly to meet short-term projections at the expense of a long-term approach to dogs on a leash – trying to make perform a trick to satisfy shareholders.

Iverson believed that a key ingredient in any effective corporate culture is people. He stated 'It is not surprising that many organizations, especially manufacturing firms, have dysfunctional cultures given the fear and distrust experienced by many workers, frequent layoffs, and an 'us versus them mentality'. Executives of Bethlehem Steel, for example constructed a golf course using corporate funds – then built a second and third course for middle managers and employees respectively. Ken Iverson questioned how a company with a culture so dysfunctional as to require the construction of three golf courses to maintain

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<sup>6</sup> Nucor Corp. and the U.S. Steel Industry, Boyd and Grove. 2000.

<sup>7</sup> Iron Age, New Steel, 1996.

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the hierarchical distinction between executives, managers, and line employees could ever expect to improve their operations<sup>8</sup>.

At times, workers and managers exhibit a level of passion for the company that can border on the bizarre. Executive Vice-President Joseph A. Rutkowski, an engineer who came up through the mills, speaks of Nucor as a "magic" place, representing the best of American rebelliousness. He says "we epitomize how people should think, should be." EVP Ferriola goes even further: "I consider myself an apostle" for the gospel of Ken Iverson. "After Christ died, people still spread the word. Our culture is a living thing. It will not die because we will not let it die, ever".

While some aspects of Nucor's management culture has changed since DiMicco took charge, there is still an emphasis on minimal hierarchy, bureaucracy and the like, Iverson's resistance to making acquisitions and going abroad has been overturned. Nucor's new approach is summarized in the Annual Report of 2008

'Nucor is now a company with 21,700 employees, successful, and the maintenance of an operations culture that focuses on what it has always done; safety, quality, efficient low-cost production and continual improvement. They also include the disciplined execution of a multi-pronged growth strategy'. Acquisitions are now part of the strategy for growth. Acquisitions are one piece of our four-pronged growth strategy, along with optimization of existing operations, green-field growth to capitalize on new technologies and marketplace niches, and international growth through joint ventures. As always, we are selective in pursuing acquisition opportunities, particularly in assuring a cultural fit with Nucor'. 'Nucor also has established an international growth platform by opening a European office and executing a joint venture investment with Duferco S. A'<sup>9</sup>. Significant progress on plans to build a state-of-the-art blast furnace to produce pig iron is noted – as a joint venture.

As a result of implementing the growth strategy, which Nucor has done exceptionally well, some questions are left in the air with regard to Nucor's evolving culture.

- How has the Iverson culture been imposed upon or placed with the new acquisitions? Have the acquisitions fallen in line?
- How will the culture fare when applied to international operations where union or union-equivalent operations are more the norm? Think about almost any country in Europe!
- Can the business model linking compensation so closely with production volume and profits at the mill level find acceptance since the model is so different in its extreme from most other corporations including those in the steel industry?
- Can you change part of a culture established by a founder and, as a management team, continue to produce above-average financial results for shareholders?

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<sup>8</sup> Nucor Corp. and the U.S. Steel Industry, Boyd & Grove, 2000.

<sup>9</sup> Nucor Corporation Annual Report, 2008.

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- With the severe economic downturn (the greatest impact on profit in the 40-year history of Nucor – with capacity at 44%<sup>10</sup> for the last quarter of 2009) and wages for regular employees off by some significant amounts (towards 50%), is the business model still valid or will the culture of the organization be affected?

Is the Nucor business model<sup>11</sup> – it's financial, operating and management culture replicable? Professor Vijay Govindarajan, a professor at Dartmouth College's Tuck School of Business Strategic Highflier<sup>12</sup> has some comments. At a time when many observers are busy hammering the final nail into the coffin of American heavy manufacturing, Nucor's business model is well worth considering. It raises the question of whether troubled companies such as General Motors (GM) and Ford (F) -- not to mention non-manufacturers such as Delta Airlines (DALR) or Verizon Communications (VZ) -- could energize their workers by adopting some version of this plan. But Nucor's path is hard to follow. It requires managers to abandon the command-and-control model that has dominated American business for the better part of a century, trust their people, and do a much better job of sharing corporate wealth.

Nucor's culture was firmly established early in the 1960s by Iverson and while some aspects, such as the attitude to acquisitions, have changed, his legacy, with respect to a philosophy of management, appear intact. DeMicco reiterated<sup>13</sup> the business model only recently in response to issues arising from the current recession. Adjustments to the culture have occurred but in the main what was set out initially remains in place.

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<sup>10</sup> Business Week, Inside the BW 50, April 20, 2009, interview with DeMicco.

<sup>11</sup> Professor Vijay Govindarajan., Dartmouth College.

<sup>12</sup> Business Week, The Art of Motivation, May 1, 2006.

<sup>13</sup> Business Week, Inside the BW 50, April 20, 2009, interview with DeMicco.

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## Nucor's management practices, organized according to 25 Factors which support, or detract from, a corporate culture of innovation.

### Factor #1: Management's emphasis on short-term versus long-term profits

Nucor has, over its history, placed a great emphasis on the need to take the long-term view. At the same time Nucor has structured its business model so that it fully recognizes the cyclical nature of the steel industry. It is therefore well positioned to withstand short-term recessions. The structure minimizes the impact of a downturn on profits when compared to others in the steel industry.

Nucor (and Iverson) make the point that they prefer 'long-term survival over short-term profitability'<sup>14</sup>. Iverson was clear on the need for a long-term view, especially when he makes reference to his responsibility to his employees. 'We run Nucor first and foremost to ensure that a decade or two from now, there will still be a place for our children and grandchildren to work without being laid off. That is our higher cause'<sup>15</sup>.

'A focus on long-term survival over short-term considerations can change every aspect of your business' stated Iverson<sup>16</sup>.

Subsequent to Iverson, Correnti makes the same point. 'One part of leadership is to make sure you keep to core values. Nucor's overriding principle is to focus on long-term success<sup>17</sup>; within which everyone in leadership here knows that means running a profitable company. The important distinction is to make sure profits don't drive everything you do. What we ask our employees to do is to care of our customers. The way we do that is by being the safest, highest quality, lowest cost, most productive and most profitable steel-products company in the world. We'll do this while being cultural and environmental stewards in the communities we live in, and we'll do it most of all by working together'.

Further DiMicco states<sup>18</sup>: 'Profits is not the first thing — you can't have a profitable company if you're not running a safe company because you don't have the right mentality. If you're not safe, you're not going to be producing quality products, you're not going to be efficient because people are going to be afraid of where they work. They're not going to be giving everything they have, and you won't have the lowest costs. For all those reasons, you won't be profitable. We do all things for the long-term success of the company'.

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<sup>14</sup> Nucor Corporation, Iverson.

<sup>15</sup> Nucor Corporation, Iverson.

<sup>16</sup> Nucor Corporation, Iverson.

<sup>17</sup> Business Week, November 22, 2002.

<sup>18</sup> Charlotte Business Journal, November 22, 2002.

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DiMicco confirms<sup>19</sup> that Nucor continues to look at the longer term over short term concerns. They will weather the current downturn, some others may not, and will emerge stronger because of their business model; low debt, low fixed costs, profit sharing and worker culture amongst other Nucor attributes.

### **Factor #2: Management explicitly looks for innovation.**

**Nucor makes limited reference to innovation per se and the word does not appear prominently in their press and other material, other than they regard themselves as 'innovators'. Other 'values' are given much more significance; safety, quality, financial and operating performance, for example.**

The transition to a steel-making company was based on Nucor's (read Iverson's) adoption of the mini-mill as a means of producing steel. This method was in sharp contrast to the processes used by the major integrated steel companies at the time. While initially Nucor made low-level products – rebar, for example – Nucor's capabilities led the company to produce ever-increasing quality of product gradually displacing a significant percentage of production from integrated mills. Nucor states that its betterment was due to two main factors;

- deployment of new technology
- Nucor's system of management; lean style, high-intensity incentives which generated hard work and a long list of innovations.

Nucor, in its mission statement, calls forth a number of principles, but not one is explicitly placing emphasis on innovation. Included are; safety, quality, cost, productivity, and profits set in a context of environmental stewardship and as 'teammates' working together<sup>20</sup>.

Much of the business press focuses on the high-profile quantum advances made at Nucor, such as the creation of flat rolled steel in an electric arc furnace and the use of iron carbide as a substitute for scrap. However, an emphasis on continuous innovation is felt throughout the organization and is equally important. A manager from Nucor's Crawfordsville mill observed that most of the innovation comes not from management, but from equipment operators and line supervisors. The job of management, says the manager, is to make sure the innovations can be implemented. For example, workers discovered that they could fine tune surface characteristics of their galvanized steel (a benefit valued by many customers) simply by making small adjustments to the air pressure of a coating process. Changes such as these do not require management review or approval. Instead, equipment operators and line supervisors are authorized to innovate and implement processes which improve production. Such innovation is routine enough at Nucor that management does not track individual improvements. Rather, Nucor tracks innovation by looking at the end result – reductions in the about of labor required to produce each ton of steel<sup>21</sup>.

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<sup>19</sup> Business Week, Inside BW 50, April 20, 2009.

<sup>20</sup> Nucor Corporation, Mission.

<sup>21</sup> Nucor Corp. and the U.S. Steel Industry, Boyd & Grove, 2000.

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### **Factor #3: Management tolerance for mavericks.**

**Nucor does not make reference to the role of mavericks in its organization per se, which is in some contrast to the many references one can find when examining the practices of other innovative companies such as 3M and Google.**

While Nucor does not make reference to mavericks per se, there are a number of references to 'unconventional thinking'. 'We have an unusually active and free exchange of ideas and solutions across divisional, geographical and functional boundaries'<sup>22</sup>.

### **Factor #4: Planning emphasizes rationing resources or identifying opportunities.**

**There is very little anecdotal information regarding their approach to cost-cutting or concern about the allocation of capital. If there are improvements identified, either by management in the case of major investments, or by workers with ideas for process improvement, there is every indication that resources are made available to make it happen.**

Nucor has chosen to avoid formalized planning processes which are typically found in Fortune 500 firms. This lack of formalization also extends to the company's mission statement – non-existent but known to all employees. The company does not have a formal mission statement as management believes that most mission statements are developed in isolation, never seen or conveyed to employees, and have little in common with what the firm really does and how it operates. Nonetheless, all Nucor employees can tell you what their job entails and what the objective of the organization is – the production of high volumes of high quality, low-cost steel<sup>23</sup>.

As with the mission, goals at Nucor are equally streamlined. Iverson noted that in some companies planning systems are as much ritual as reality, resulting in plans and budgets which are inappropriate and unrealistic. Nucor has both long- and short-range goals. However, they are handled differently than at many firms.

Short-term plans focus on budget and production for the current and next fiscal year. The plans are zero-based – created from actual needs and estimates for specific projects – not an updated copy of a prior-year's budget. Long-range plans are a combination of the plans of different divisions and plants – a bottom-up approach to planning.

The long-range plans are seen as guides – not gospel. The plans incorporate relative goals instead of specific milestones which the firm expects managers to achieve. Division and plant manager's set their

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<sup>22</sup> Nucor Corporation, Corporate Overview.

<sup>23</sup> Nucor Corp. and the U.S. Steel Industry, Boyd & Grove, 2000.

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target goals knowing that they will be rewarded for meeting them, but not punished if for unexpected reasons they are not met.

Similarly, even plans for specific projects are minimalist. For example, the company handles new mill construction largely internally. Many aspects of the plant design are done 'on the fly' to save time. The company does not create finely detailed construction plans for new plants. Instead, they use this experience as a guide for starting construction. They then fill in the details as construction proceeds. This approach allows Nucor to construct plants both faster and at less cost than their competitors: the Hickman, Arkansas mill was completed six months ahead of schedule -- going from groundbreaking to first commercial shipment in a mere sixteen months<sup>24</sup>.

There is no formal business plan agenda in place, nor does the company have an overriding business plan that is public knowledge. Information about the company's performance is shared<sup>25</sup> openly with employees, and employees are encouraged to provide solutions to problems they face, but the strategic direction of the company was largely left to Iverson latterly to Aycock and, following the pattern, now to DeMicco and his executive team.

#### **Factor #5: Management's tolerance for failure.**

##### **For Nucor, failure is an accepted part of the culture.**

Nucor 'workers excel because they are allowed to fail'<sup>26</sup>. Managers encourage employees to try out new ideas. As Nucor states, some ideas work out while others do not. Failure is tolerated and, according to their own beliefs, this gives the company its reputation as being creative and having one of the most action-oriented work forces in the world.

Iverson was explicit on his view of failure; 'Risk by definition carries the possibility of failure. Study it, but never, ever hid from it'<sup>27</sup>. He went on to talk about managers and his expectations with regard to success and failure; 'put the average person in a management position and he will make 50% right decisions – a good manager makes 60% good decisions'. His take on what to do next is the most interesting where he states that it is up to the employees to tell the managers when they make the 40% wrong decisions and how they could do better.

The Nucor philosophy toward innovation is that attempts at improvement will be accompanied by failures. Tony Kurley, a Nucor plant manager, recalls Nucor Chairman Ken Iverson expectation that success is making the correct decision 60 percent of the time. What is important isn't the mistakes that are made, said Iverson, but the ability to learn from the 20 percent that are truly mistakes and the 20 percent that are suboptimal decisions. This willingness to modify on the fly and "shoot from the hip," as one melt-

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<sup>24</sup> Nucor Corp. and the U.S. Steel Industry, Boyd & Grove. 2000.

<sup>25</sup> Lots of Essays.com, Nucor Corporation

<sup>26</sup> Nucor Corporation, Inspiring a Work Ethic.

<sup>27</sup> Nucor Corporation, Iverson.

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shop supervisor puts it, makes Nucor an exciting place to work. The lean, flexible workforce is continually trying new things, doing different jobs. Employees continue to engage in risk taking because the company rewards success and does not punish for failures. The result is employees, from top managers to hourly personnel, being willing to take risks to achieve innovation and take ownership in their jobs<sup>28</sup>.

The startup of the Crawfordsville mill during 1987 is but one account of how much risk the management team and workers at all levels were willing to tolerate in order to see an idea accomplished. Even though Iverson (Nucor) had a guarantee from S.M.S. that it would get its money back if the equipment did not work, the whole project was high risk at the time and reputations all around would suffer if failure were to occur. The accounts of personal risk<sup>29</sup>, at the operator level, are equal to those assumed by the corporation. Most corporations would not, at least today, assume the personnel risk which was inherent in this venture.

#### **Factor #6: Leaders emphasize management of people and their interactions.**

**Nucor, in its stated objectives of minimizing hierarchy, emphasizing communications and keeping in touch at all levels, places a great deal of emphasis on people management and their interactions.**

Correnti has this to say; 'Nucor strives to provide high quality products at competitive prices, and prides itself on maintaining a close relationship<sup>30</sup> with its workers that has resulted in the company successfully resisting unionization efforts in an industry that is highly unionized'. He goes on to describe his leadership style, 'It's simple but thoughtful in that it's a combination of being involved<sup>31</sup> without drilling down and being controlling. It's a combination of constantly challenging and creating focus on issues important to the success of our company, shareholders and employees but not being overbearing. It's giving people the freedom, resources and training to do their jobs but not getting in their way. Leadership is always about people, and people are as diverse as stars in the sky. Your main job as a leader<sup>32</sup> is to have a positive impact on motivating and making the right decisions to support the people in the organization. You can't do it yourself'.

DiMicco states that his style<sup>33</sup> is not to rely too heavily on electronics to keep in touch, one has to 'get out there and be face-to-face...visit the plants and get that one-on-one contact.... and that this is a major commitment'.

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<sup>28</sup> Nucor Corp. and the U.S. Steel Industry, Boyd & Grove, 2000.

<sup>29</sup> New Yorker, The Annals of Enterprise, Richard Preston, March 4, 1991.

<sup>30</sup> Lots of Essays.com, Nucor Corporation.

<sup>31</sup> Business Week, November 22, 2002.

<sup>32</sup> Business Week, November 22, 2002.

<sup>33</sup> Charlotte Business Journal, November 22, 2002.

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At Nucor the art of motivation is about an unblinking focus on the people on the front line of the business. It's about talking to them, listening to them, taking a risk on their ideas, and accepting the occasional failure. It's a culture built in part with symbolic gestures. Every year, for example, every single employee's name goes on the cover of the annual report.

**Factor #7: Corporation provides career ladders, powers and titles for innovators.**

**Nucor does little to recognize, by non-monetary means, those who innovative as distinct from those who are not seen to be innovators.**

Nucor, which so emphasizes equality, and no special individual rewards or emphasis on individual effort would find this Factor counter to its culture. There is no anecdotal evidence that Nucor recognizes innovators – as individuals - in any particular way.

Unlike 3M and P&G, along with other innovative companies, there does not seem to be a range of non-monetary recognition of innovators per se.

**Factor #8: Corporation is tolerant towards variances from the corporate norm.**

**Nucor, because of its early initiatives with the introduction of mini-mills; a totally disruptive technology at the time, has a tradition of going against the traditions of the steel industry. Nucor's own culture was dramatically different than the traditions in the steel industry world-wide.**

Nucor, itself, was different than the corporate norm in the steel industry right from its outset. Almost all of the tenants of Nucor flew in the face of what was then regarded as the culture of the steel industry – whether in the U.S. or almost anywhere in the world. Iverson stated that his values were as follows;

- safety
- informality
- caring
- freedom
- respect
- equality

At least the last 5 of these 'values' were very different from the culture of the major steel mills. The first of these, safety, is given emphasis largely because of the disastrous experience of starting up the Crawfordsville mill. For an excellent account of this high risk start up read *The Annals of Enterprise*<sup>34</sup>. The death rate at Nucor was, in the 1990's, 3.7 times that of the integrated mills<sup>35</sup>, another reason for safety being so high on the list.

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<sup>34</sup> New Yorker, *The Annals of Enterprise*, February 25 and March 4, 1991, Richard Preston.

<sup>35</sup> New Yorker, *The Annals of Enterprise*, March 4, 1991, Richard Preston.

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Iverson went on to state that he has 'little respect for the politics, the pettiness, the fixation on rank and status – needs that people in most big companies endure as a matter of course'<sup>36</sup>. Without a doubt he was referring to the big integrated steel mills and their management style at the time.

Almost everything that Nucor stood for at its beginning flew in the face of traditional steel making norms – which were well established by the integrated mills. For example, Nucor had very few employees working behind desks, they feared white-collar bloating, rejected unions, and work rules, avoided authoritarian management, and motivated its workers by means of production bonuses.

#### **Factor #9: Management's tolerance for uncertainty (as distinct from risk) in the planning process.**

**Nucor does not spend a lot of time on planning; not using the elaborateness of many other corporations. Because of its successful experience it developed a culture built on the confidence that it could handle any start-up, and mostly using their internal resources. Thus what others may have seen as high risk, Nucor's people saw as less risky. Management demonstrates a high tolerance for uncertainty, when compared to corporations of a similar size.**

Nucor demonstrated a propensity towards assuming significant risk in the manner in which they went about establishing the Crawfordsville mini-mill. They 'play hard and fast in a startup and operation of a plant – that is, to take business risks, operational risks, and even personnel risks, in their efforts to raise production'<sup>37</sup>. Nucor's tight fit drove its successful expansion. It paid close attention to developing technology both at home and abroad, and had a management structure and team willing to take risks<sup>38</sup> by investing in such technology. The lack of bureaucracy in the company allowed for speedy decision-making, while a competent, independent workforce ensured smooth implementation and operation once decisions had been made.

Having gone through the Crawfordsville start up, mostly successfully, is perhaps one of the reasons management could contemplate and carry out similar risky ventures. They knew that with their management team and worker support they could 'muddle' through the non-predictable problems that always arise on a start-up. The culture on start-up became a strength for the whole company.

#### **Factor #10: Degree of formal communication in the organization**

**Nucor places emphasis on trying to break down communication barriers.**

The emphasis which Nucor places on the minimization of hierarchy is directly related to the need for bettering communication within the company. With only 5 layers of management from CEO to front-line employee, the idea is to 'facilitate easy and efficient communication'<sup>39</sup>. This is, in Nucor's terms, tied back

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<sup>36</sup> Nucor Corporation, Iverson.

<sup>37</sup> New Yorker, The Annals of Enterprise, March 4, 1991, Richard Preston.

<sup>38</sup> A Study on Evolution Toward Strategic Fit, Gordin, 2007.

<sup>39</sup> Nucor Corporation, Our Story, Eliminating Hierarchy.

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to the belief – the culture – that employees not managers – drive success and that and that this results from a sense of equality and the importance of each individual to the success of the company.

Iverson's comment "There's nobody at this company who's covering their ass with paper"<sup>40</sup> says it all when it comes to understanding the type of communication which was the norm at Nucor. Little paper but a lot of 'walk-about's' to meet workers was the order of the day. Iverson made an attempt to visit each plant on a regular basis and greet as many people as he could, as does DiMicco to this day.

The strengths that Nucor possesses are its position in the industry, its financial health, and a strong management team. These are the factors that have made it possible for the company not merely to survive, but to thrive in its highly competitive market, and they are factors which form a strong foundation for facing the future. To this point, Nucor has operated with very little formal structure, which has been a successful strategy during the years where the mini-mill market itself was growing. It's a full-time job; communication is one of the important<sup>41</sup> philosophies of Nucor throughout its history. We have few, if any, middle managers and no unions. We're a \$4.5 billion company with 30-plus operating divisions. Without that communication, you run into major problems; you have to work at it. The great thing today is technology makes it easier than ever to communicate. You have to be careful — you can't rely just on electronic communications. You have to get out there and be face-to-face. One of my leadership styles is to visit the plants and get that one-on-one contact. I've (DiMicco) been to every one of our divisions for a full day, twice, in the 2 1/2 years I've been CEO. It's a major commitment.

Using our Web site, e-mail and cell phones to stay in contact — using them all and maintaining the philosophy of management by walking around — has always been Nucor's style. Like Ken did, I answer my phone today. Getting back to employees as soon as possible when they contact you is important.

**Factor #11: Management discourages or encourages the use of independent work groups.**

**Nucor makes a very strong point that its divisions or operating units are very autonomous.  
Additionally, the desire is to keep units as small as possible.**

Nucor places a great deal of emphasis on the autonomy of its operating divisions, which could be considered, in the context of a major steel producer, an example of the use of independent and smaller groups, each with a focus on a particular task. Compensation is based on performance and it is not the performance of the individual but rather the group that determines the amount of compensation. In steel lingo this refers to the amount of 'prime steel produced each day'<sup>42</sup>.

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<sup>40</sup> New Yorker, The Annals of Enterprise, March 4, 1991, Richard Preston.

<sup>41</sup> Charlotte Business Journal, November 22, 2002.

<sup>42</sup> Nucor Corporation, Stake in the Company.

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One presumes that, at the time of a green fields start-up, a project team is formed and drawn mainly from internal staff – with minimal outside support as is Nucor's style. Such teams are then dispersed back to their source when the project is completed.

**Factor #12: Degree to which management decisions are made with input from the rest of the organization.**

**One of the strong cultural beliefs at Nucor is the belief that everyone matters equally. Procedures exist for facilitating the movement of ideas upwards through the organization and management is charged with the responsibility of making sure the 'idea-flow' system works.**

While Nucor is a Fortune 500 company with approximately 200 operating facilities, 90 businesses, including the wholly-owned subsidiaries of Harris Steel and The David J. Joseph Company, there are fewer than 95 people working at our corporate headquarters and surprisingly few layers of management from the CEO to the front-line worker.

Pushing decision-making to the lowest level is one of the tenants of Nucor. It is founded on the belief that when you push decision making down you make each worker more productive<sup>43</sup>. Turning everyone into a decision maker is the idea.

At Nucor there is a belief that ideas, no matter from what level the idea may spring, will move ahead and be reviewed fairly. Similarly, complaints are handled in an efficient manner and there is a facility for appealing complaints if the employee seeks, in his/her mind, fair consideration<sup>44</sup>.

**Factor #13: Formality of the decision process.**

**Nucor places emphasizes on informal management practices in place for making key decisions.**

Our company consists of 90 businesses that operate independently but compete collectively. We have an unusually active and free exchange of ideas and solutions across divisional, geographical, and functional boundaries. Key decisions in Nucor are very much done at the mill level. The mills have a 'surprising amount of freedom in meeting the needs of their customers'<sup>45</sup>.

**Factor #14: Availability of award mechanisms for innovation.**

**There is no anecdotal evidence to suggest that Nucor has any reward mechanisms in place for innovation per se. Monetary rewards seem focused on rewards for financial and operating performance at the group level.**

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<sup>43</sup> Nucor Corporation, Turning Everyone into a Decision Maker.

<sup>44</sup> Nucor Corporation, Employee Relations Principles.

<sup>45</sup> Nucor web site – Trust and Freedom.

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Nucor's compensation system rewarded groups, not individuals, for improvements in pre-determined productivity and quality standards, and not for innovation per se. Of interest, the standards were based on experience and not on the traditional approach resulting from an industrial engineering study. Standards were changed only where there was an equipment or technology shift and typically only 5 - 10% of the standards were changed annually. The low level of change might suggest, again, a great deal of trust between management and those whose bonuses are affected by the standard. The consequence of this system was that bonus payments could average between 80 and 150% for employees. Cash compensation was higher for Nucor employees than that paid to employees of integrated mills even though the base wage was lower for Nucor. The net effect is that such a system might well encourage the rapid introduction of small improvements to productivity were immediately noted in performance improvement and individual pay checks.

The use of giant chalk boards setting out each production group's latest performance provides for a totally transparent communication of results, but this does not address innovation except indirectly as noted above.

Even Iverson's own compensation was related to the performance of the company. When he was listed as the lowest paid CEO in the Fortune 500 list, it was his position that he was proud of this since, in his own assessment, the company was not performing<sup>46</sup>. Further, he explained that there was a link with the practice of layoffs and it was not his idea to lay off employees at each and every dip in the economy. Rather the approach at Nucor is to cut back on individual hours. At last count, no employees have been laid off due to a turndown in volume. Compensation has been reduced but jobs have not been lost.

#### **Factor #15: Planning orientation versus action orientation.**

**Nucor prides itself on not taking a lot of time to make important decisions. 'Do it', 'Don't sit on it', seem to be the mantra.**

Nucor prides itself on its action orientation 'Meaning don't study an idea to death with experts and committees'..... 'get on with it and see if it works'. This is attributed to Ken Iverson<sup>47</sup>. Nucor employees don't need a memo to get going<sup>48</sup>. They spot little problems and solve them on their own before they become big problems.

As with the mission, goals at Nucor are equally streamlined. Iverson noted that in some companies planning systems are as much ritual<sup>49</sup> as reality, resulting in plans and budgets which are inappropriate and unrealistic. Nucor has both long- and short-range goals. However, they are handled differently than at many firms.

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<sup>46</sup> Nucor Corporation, Iverson.

<sup>47</sup> Nucor Corporation, Technological Leadership.

<sup>48</sup> Nucor Corporation web site.

<sup>49</sup> Nucor Corp. and the U.S. Steel Industry, Boyd and Grove, 2000.

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Short-term plans focus on budget and production for the current and next fiscal year. The plans are zero-based – created from actual needs and estimates for specific projects – not an updated copy of a prior-year's budget.

Long-range plans are a combination of the plans of different divisions and plants – a bottom-up approach to planning. The long-range plans are seen as guides – not gospel. The plans incorporate relative goals instead of specific milestones which the firm expects managers to achieve.

Division and plant manager's set their target goals knowing that they will be rewarded for meeting them, but not punished if for unexpected reasons they are not met.

**Factor #16: Attitudes towards merger, acquisitions, joint ventures, divestiture.**

**Nucor has passed through two distinct phases in terms of management's attitude to expanding by acquisition. Iverson was opposed to any such action – which led to a Board revolt – and more recent history indicates that acquisitions are the order of the day.**

Nucor did not grow by acquisition nor go abroad<sup>50</sup> - so stated Iverson. That is what he believed and he stuck with that philosophy until his ousting. Iverson vents his view towards mergers or acquisitions when he states that 'every merger or acquisition is followed by a bloodletting – except at the top, where executives either get promotions or ride off into the sunset, their saddlebags stuffed with money. No wonder there is so much cynicism in the work place'<sup>51</sup>.

Aycock was convinced that Nucor had to break from the past to meet the company's aggressive growth goals. "How can we step up to the next level?" he asked. "Foreign and domestic rivals have been turning up the heat. We have plucked all the ripe, low hanging grapes. Nucor needs new moves.

Under Iverson, the company did not believe in acquisitions<sup>52</sup>; he was committed to building new plants from scratch. Aycock, however, advocated acquisitions.

Currently, Nucor values future expansion through acquisition<sup>53</sup>. Whether the new company is acquired through a buyout or hostile take-over, the effect of mixing two distinct business cultures is a risk. Loss of key knowledge employees, skilled labor, or other valuable assets must be addressed. The transitions must be smooth. "The most valuable asset and competitive advantage gained by acquiring a new business is the knowledge of its workers." Additionally, the cultures within individual factories can be a risk.

**Factor #17: Management's expectations regarding loyalty to the company versus personal development.**

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<sup>50</sup> KIverson.pdf.

<sup>51</sup> Nucor Corporation, Iverson.

<sup>52</sup> Tuck School of Business, 2001.

<sup>53</sup> Case Analysis, Ben Johnson, March 7, 2008.

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**There is little anecdotal evidence to suggest that Nucor allows or encourages any 'personal' activities while on-the-job.**

Nucor's emphasis is on group performance, whether at the divisional level or with factory-floor group performance. With this priority it is highly unlikely that an individual's time could be any more than totally devoted to the work place. Group members would require total dedication to the job as the performance by any one member could adversely affect the group and consequently its bonus payments.

Nucor comments, on their web site, on one aspect of what they expect from their employees regarding personal time. So "empowerment has gone beyond a corporate buzz word and become a way of life at Nucor" ...to employees who take in upon themselves to create new and better ways to produce steel – even when they are off the clock". Not a requirement nor an expectation but an implicit suggestion that this is good practice for the individual employees and would get noticed<sup>54</sup>.

There is no reference to the use of personal time, as there is in 3M and Google, which have fairly explicit statements regarding this issue; i.e. the 15% rule at 3M.

**Factor #18: Decentralization versus centralized hierarchy.**

**Nucor is committed to a policy of minimal hierarchy. The early goal was nor more than 5 levels. Now with the organization having grown their commitment is to as close to a flat organization as you can get given the size of the global organization.**

Elimination of hierarchy has been one of the major tenants of Nucor since its inception. With a small number of personnel at headquarters located in Charlotte, North Carolina, the company operated, for many years, with 5 layers of management from the CEO to the front-line employee. The philosophy is based on 'employees – not managers - drive our success'<sup>55</sup>. The company gives equal importance to each person – as they state.

Even at the beginning, Nucor was very concerned about hierarchy and how, with growth likely to take place, they could remain lean and not develop a bureaucracy so prevalent in the major steel companies of the day. Busse tells Iverson that he is worried that Nucor might one day resemble big steel<sup>56</sup>. Referring to 'big steel'; "They are a culture, it's a bureaucratic culture, and there isn't a nickels worth of difference between them".

Nucor made strenuous efforts to minimize status-related differences among its employees<sup>57</sup>. Examples included; same holidays, same insurance coverage, on the factory floor everyone wore green spark-proof

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<sup>54</sup> Nucor Corporation web site.

<sup>55</sup> Nucor web site, eliminating hierarchy.

<sup>56</sup> New Yorker, The Annals of Enterprise, March 4, 1991, Richard Preston.

<sup>57</sup> KIverson.pdf.

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jackets and hard hats, no assigned parking places, nor boats, nor planes. Air travel was in coach class and loyalty programs accrued to the company. A local deli served as the company's executive board room. To this day, the annual report lists the names of all employees; a neat feature especially with now over 22,000 employees. Iverson's management philosophy was based on few layers of management and egalitarian working conditions<sup>58</sup>.

Iverson's decision to locate the corporate headquarters away from operational centers<sup>59</sup> was indicative of his desire to give managers the complete freedom to operate as autonomously as possible. The action also implied a 'trust' among the senior management group.

Interestingly Iverson was not about to make decisions on where decisions should be taken and instead asked Division Managers to decide on whether decisions would be made locally or more centrally – but once the decision was made there was an expressed need to stick with the decision. He also stressed 'smallness'. Nucor thinks of itself more as a family than a large corporation and that is derived from the autonomy given to operating divisions; a large amount of decision making is given to the operating units. Each mill is 'honest-to-god autonomous' according to one manager.<sup>60</sup>.

Iverson makes the point that 'it is not enough to attack hierarchy – you have to destroy it'<sup>61</sup>.

Correnti explains decentralization – delegation of authority and along with it a sense of individual responsibility. "I don't want to take the steering wheel out of the melt shop manger's hands with respect to purchasing or any other operating decision. Because then if his performance is not adequate, he will say, "Correnti bought the electrodes, he paid too much or he bought the wrong quality." I want to keep the decision making in his hands so he can look in the mirror at the end of the day and say, "I made money today for Nucor because I made the decision" or "I lost money today for Nucor because I made the decision," not somebody back in Charlotte, North Carolina. You want to put the decision making as close to the source as possible. You want to keep pushing it down, to let the operators control their own destiny"<sup>62</sup>.

Correnti explains that his philosophy is not that much different from that of Ken Iverson. It's very similar to Ken's. He was a strong believer in teamwork as a driving force in any company. He focused on long-term issues. We share those beliefs. He believed in empowerment, allowing for major autonomy and decentralization<sup>63</sup> in the way the company functions. 'We're similar but not identical'.

Historically, Nucor has been decentralized with control at the factory level over operational decisions and processes. As new corporate goals for growth through acquisition and international growth become

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<sup>58</sup> KIverson.pdf.

<sup>59</sup> KIverson.pdf.

<sup>60</sup> Nucor Corporation, Granting Trust and Freedom.

<sup>61</sup> Nucor Corporation, Iverson.

<sup>62</sup>Ahlbrandt, Fruehan & Giarratani, 1996.

<sup>63</sup> Business Week, November 22, 2002.

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present, this strategy is being replaced by a corporate centered approach<sup>64</sup>. With much of the financial control at the district level, the corporate headquarters does not maintain much infrastructure. Throughout the early years of the company there were only some 30-40 employees at headquarters. Recently, this has increased with a new level of corporate executives to group products into divisions and regional control. A new acquisitions department of 5 well-trained employees is responsible for the focus on growth through acquiring other businesses.

**Factor #19: Availability of resources (budget, time, etc.) for new ventures.**

**Nucor has such a strong track record of expansion, both pre and post Iverson, although in different ways, that there must be a sense amongst most employees that if opportunities can be defined, the corporation is willing to take a careful look and invest.**

Nucor, under both Iverson and now DiMicco, have expanded dramatically; in the earlier years with the adoption and risk taking of new technologies, and more recently through the acquisition of a variety of steel making or processing companies. One assumes that the identification of new technologies and take-over targets is very much the prevue of head office staff and more particularly the actions which senior management are most concerned. Nucor's financial and operating performance track record would lead one to believe that there is no shortage of capital for new ventures.

**Factor #20: Staff versus line involvement in the decision process.**

**At Nucor there seems little distinction between staff and line functions. With a nominal-sized headquarters staff (which could be regarded as staff) and minimal staff at the operating unit level, along with the emphasis on 'everyone' being involved in decision making, such a distinction has little meaning.**

Nucor has an exceedingly small headquarters staff located in Charlotte, North Carolina. At last count the number was quoted as 95. A 'bloated' staff was one of Iverson's and Busses' pet concerns; derived from their abhorrence of the bureaucracy of the integrated steel mills.

There is also a culture at Nucor which places emphasis on a managers responsibility to make sure that ideas, generated anywhere in the organization at any level, find their way through the organization and are given fair consideration. In other words, ideas and input are sought from throughout the organization.

**Factor #21: Ability to retain innovators.**

**There is no anecdotal evidence to suggest that innovators at Nucor either stay or leave. Employee turnover, however, is low.**

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<sup>64</sup> Case Analysis 1, Nucor Corporation, Company and Industry Analysis, Johnson, 2008, BUSA 490, Capstone.

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#### **Factor #22: Extent to which management has an innovative tradition.**

**Nucor is a company known for its innovative tradition but it is company where the reputation has been gained by being an early adapter, rather than developer, of new technologies. Iverson's management practices were, on the other hand, very innovative in the steel industry.**

The innovative tradition at Nucor can be traced to several of the major risks which the company took in adopting the technology developed by S.M.S. of Germany. This was a high risk project which has the whole steel industry watching while the large experiment was taking place<sup>65</sup>. Nucor innovated by adopting and refining and commercializing the new technology. A prime example of Nucor's innovation was their foray into sheet steel. By the mid-Eighties, Iverson had anticipated the coming shake-out among mini mills: the lure of easy pickings from dinosaurs like Bethlehem Steel had drawn many firms into the mini-mill business and resulted in oversupply. Integrated mills produce steel sheet by starting with ten-inch thick slabs of steel and repeated processing the slab through rollers to reduce thickness and increase width. Multiple rolling machines result in a production line hundreds of yards long. Conventional wisdom said that it was impossible to produce the 10 inch thick steel slabs needed to roll sheet steel in a mini mill: their small electric arc furnaces simply did not have the same capability as the blast furnace used by an integrated mill.

Nucor also has an innovative tradition when it comes to managerial practices. Largely due to Iverson's philosophy, they were very different from traditional steel industry practice. A summary of these innovative management practices would include:

- minimal hierarchy; 5 levels top to bottom,
- head office staff at a minimum – lean,
- pay based on performance with the senior executives having the highest portion of compensation at risk,
- low wage coupled with big bonus for meeting or exceeding production targets,
- risk assumption with unproven technology,
- no perks,
- a practice of equality unheard of before in the steel industry and many major corporations
- minimal paperwork,
- autonomy at the local level,
- facilities located in rural areas to take advantage of the work ethic of rural America.

Management actions, even for the most insignificant kinds of actions (such as non-designated parking spots), are in support of the above practices and therefore add credibility to the original intent. Follow-through is evident and builds support for and from the whole organization.

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<sup>65</sup> New Yorker, The Annals of Enterprise, February 21 and March 4, 1991, Richard Preston.

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### Factor #23: R&D budget levels versus the competition.

Nucor, while maintaining that it does not have a R&D department per se, also makes the point that it is a leader in innovation – in the steel industry. Further, it maintains that each employee is the embodiment of R&D in the organization. Nucor has been innovative by putting in place a vast array of managerial initiatives which were contrary to the norm in the steel industry. Nucor is best known for adoption of new technology, developed elsewhere but proven at Nucor. It is not known for its product development.

'For us, research and development is not a department. It's a way of life; one that's lived and breathed by each and every one of our 22,000 employees every single day. And that's why we are, hands down, the industry leader in innovation'<sup>66</sup>. That is the current mantra regarding innovation.

Nucor does not have an R&D department and makes a significant point to this effect in its published literature<sup>67</sup> but also makes the point that in spite of this lack, the company has a number of technological initiatives to its credit. The examples referenced include;

- the mini-mill
- electric arc furnace
- thin-slab casting
- micro mill (or thin-strip casting)
- HIsmelt - a joint venture development with an Australian company to produce high quality pig-iron with benefits for the environment and energy consumption.

Thus there are several examples of Nucor's approach to adopting emerging technologies; avoiding the development risk through the formation of joint ventures/partnerships with a variety of suppliers and organizations wanting to get their technology in place in the steel industry.

R&D in the steel industry is supported by a variety of sources; academic, integrated steel mills, industry institutes, equipment suppliers and lastly, industry consultants. These are the sources of new technological and product development ideas in the steel industry.

Nucor carefully researched<sup>68</sup> emerging technology. Rather than develop a proprietary system, they licensed and modified a new German caster and began a \$270 million experiment. This new plant - in Crawfordsville Indiana - started up in 1987. The process was very different from making sheet steel in an integrated plant. Nucor's system involved the highly controlled continuous pouring of molten steel into a narrow mold and onto a conveyor belt to form a continuous two-inch thick ribbon of semi-solid steel – pouring steel much in the same manner as frosting an endless cake using a pastry tube. The process requires sophisticated computer technology and monitoring to ensure constant quality and avert costly

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<sup>66</sup> Nucor Corporation, Corporate Overview.

<sup>67</sup> Nucor Corporation, Technological Leadership.

<sup>68</sup> Nucor Corp. and the U.S. Steel Industry, Boyd and Grove, 2000.

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and dangerous spills. This precisely sized ribbon of steel is then rolled to the specific thickness using a few, smaller sized rolling machines. This results in a much smaller and less expensive plant than a traditional mill for the production of sheet steel.

In a risky move that committed a large portion of their assets, it announced the decision to invest in thin-slab casting, a form of technology developed by the German company S.M.S. Comcast<sup>69</sup>. The proposed timeline projected a new mill becoming fully operation within three years. "In Crawfordsville" Iverson stated "we have one of the largest research units in the world. It's a one-million-square-foot factory"<sup>70</sup>. Nucor was clever at adapting someone else's technology; akin to the last few stages of the typical research and development function.

Within a few months of the Crawfordsville move, Nucor also announced a joint venture with Yamato Kogyo of Japan. In September, the firm entered the import-dominated steel fastener business, and in December Nucor purchased a bearing manufacturing facility, the first major manufacturing concern to be bought, instead of built.

Thus Nucor started on a streak of acquisitions which would bring in-house the skill sets, product lines and facilities of the acquired companies. Established businesses, which were in trouble or needed modernizing or a new business model, were therefore brought in to the Nucor fold.

**Factor #24: Perception of innovation increasing or decreasing.**

**Nucor's pace of innovation, of the kind that has been the pattern since inception, has not changed.**

Nucor, through its non-stop acquisitions and establishment of green-field facilities, continues to implement new technologies. In recent years it has entered into a number of joint venture agreements, most recently into an initiative for a new iron-making technology. Innovation, in the Nucor style, continues apace.

**Factor #25: Degree to which employee organizations encourage innovation.**

**There is no anecdotal evidence to suggest that Nucor even has an employee organization and it most certainly does not have a union.**

Date Prepared; October, 2009

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<sup>69</sup> Nucor Corporation, A Study on Evolution to a Strategic Fit, Gordin,

<sup>70</sup> New Yorker, The Annals of Enterprise, March 4, 1991, Richard Preston.