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STRUCTURAL CAPITAL - A STRATEGIC QUALITY ENABLER AT RELIANCE, INDIA

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ABSTRACT

Reliance Industries Limited, India’s largest private business house (turnover US $17 billion) features in 2004 Fortune Global 500 list. Ranked among the world’s ten most respected energy/chemical companies, its activities span oil and gas exploration cum refining, manufacturing petrochemicals and textiles and exporting to more than 100 countries.

To create product quality excellence, Reliance focuses on building capable processes using state-of-the-art technology and empowering employees through continuous learning. Quality conscious employees are the driving force behind Reliance’s unprecedented growth. Reliance believes quality as inseparable element of performance and hence it makes available to the operating personnel tools and techniques, information and knowledge, success and failure learning lessons-- that keeps people ahead of problems. All of this needs to be available in a user-friendly manner and Just-in-time.

Accordingly Reliance has, with help from quality, training and line function professionals, created a unique Management System and calls it Structural Capital (SC) portal. SC is the knowledge, which remains within an organization when an employee leaves the workplace.

SC portal connects people over vast geographical locations. Experts aim to enhance workplace performance by making knowledge available to the right person at the right time. For populating the Portal, knowledge is classified as Scriptural or Organic. SC portal at Reliance provides an integrated solution for scriptural information and operating knowledge updates to the employees for diagnosing root cause of problems and process capability & quality improvements. Structural Capital can be likened to an ever-increasing repository to which knowledge is credited and drawn by the people. Successful incorporation and utilization of SC portal has proved that, this management system has a capability to remain a step ahead of potential problems.
INTRODUCTION

Objectives of Paper:

1. Apply the Structural Capital framework to develop an integrated solution which will improve the process quality & operating performance.
2. Evaluate the impact and use of technology in performance improvement.

Reliance is a rapidly growing organization in multi-locations. As a part of growth plan, experienced employees move to new projects at other locations and relatively less experienced employees, after formal training and validation look after day-to-day plant operations at our manufacturing locations. Reliance is ISO 9000/14000/18000 certified organization. Each product quality is in line with international requirement of the customers.

Leadership focuses on empowering employees through continual learning to manage the Business processes effectively and efficiently. To achieve this, the effectiveness of our 7-year-old online Quality & Learning management system was regularly evaluated and improved. But, the overall effectiveness was still at level 2 (learning). This necessitated quality & training function to transform its role from a Service Provider to a Strategic Business Partner. The top management of company felt that, it should sustain it’s continual improved performance for more than coming 100 years.

The main reason for low effectiveness of the Quality & Learning system was that it was not capturing the organic (evolving) expert knowledge or success and failure learning. While the juniors had the scriptural knowledge gained from technology manuals, SOP’s, Check sheets they lacked the organic knowledge gained through experience.

A Structural Capital (SC) was developed by line function, central technical/engineering, quality & training professionals to bridge this gap. SC represents the knowledge assets that will complement human capital to create value. It ensures that appropriate knowledge is made available to empower right people at right time. By integrating with earlier knowledge management efforts, the effectiveness of quality & learning systems improved to level 5. Return on investment is 112%.

The success of this practice in one Plant encouraged us to replicate in other 90 nos. manufacturing Plants. Successful integration, utilization and business result has demonstrated that organizational learning in a conductive environment can create win-win for all stakeholders.

STRUCTURAL CAPITAL (SC):

In a rapidly growing multi-location organization, there is a need to relocate experienced employees for commissioning new projects, turn around jobs and improving efficiencies of existing plant operations at short notice leaving day-to-day operations to relatively less experienced employees.

Top Management focuses on empowering employees through continual learning to manage the processes effectively and efficiently. The integrated quality management system is implemented to carry out effective internal auditing.
system, management review. The voice of customer is captured & addressed in integrated management system for continual improvement & for the customer satisfaction. On an average, each and every employee spends about 64 hours of training per annum and our annual quality management system & training expenses comes to approximately 5 % of our payroll expenses. Some of the identified employees are groomed as Specialists in their disciplines as a part of the Learning initiative. The effectiveness of our 7-year-old online quality & learning management system was evaluated regularly and improved. In spite of the regular improvements made, the effectiveness of the quality/learning system was still at level 2 (learning) and in a segmented manner at level 3 (Behavior) two years ago. On analyzing, it was found that the main reason for this low effectiveness was that there was a gap in transferring learning from training context to the workplace and its consequent impact on business results. It was noted that the quality/learning system was not capturing the organic (evolving) knowledge within the organization and outside from those in similar business. The success and failure learning was also not captured in a structured manner.

The main reason for low effectiveness of the Quality & Learning system was that it was not capturing the organic (evolving) expert knowledge or success and failure learning. While the juniors had the scriptural knowledge gained from technology manuals, SOP’s, Check sheets they lacked the organic knowledge gained through experience. As a result, the Top Management recognized the need for the quality/training function to expand its role from being a Service Provider to a Strategic Business Partner.

To implement this transformation, the topmost executive of the organization, a firm believer of quality/learning organization was put in-charge. A core team representing professionals from Production, Maintenance, Quality Assurance, Training, Information Technology and Technical Services functions assisted him. The team consisting of employees drawn from top, middle and junior management levels identified the actions to bridge the gaps in the Learning system, by making it more application oriented in the workplace.

It was decided to create a Structural Capital (SC) that will complement the existing Quality/Learning Management Systems. SC represents the knowledge assets that complement human capital to create value for all stakeholders. It involved significant change in terms of knowledge processes, mind-set and culture in the organization. It was considered as being represented by 3 prongs - People, Process and Technology. The purpose of developing SC framework was to enable the organization move to successfully higher levels in Quality & Learning. The purpose was to enable the organization not to depend on individual skills and abilities, but to leverage internal and external resources of expertise to realize measurable benefits through knowledge sharing. It will also help the organization respond proactively to changes in technology and business environment.

The purpose of developing Structural Capital was to capture not only the scriptural information documented in technology/vendor manuals but also the knowledge generated in the minds of experienced personnel as they experience success and failure learning. Less experienced personnel across multiple locations capture this knowledge. It empowers them take informed decisions to solve problems related to process upsets and equipment/systems failures, improvement in the effectiveness and efficiency of processes and systems, reducing wastage and improving product quality. This has led to enhanced productivity of people and assets, increased profits, a culture of knowledge sharing, reduced cycle time for problem solving, reduced problems, enhanced training effectiveness, effective decision making and increased employee loyalty due to greater empowerment.

The goals of this practice which have remained same since its inception are

- To empower the relatively less experienced employees with the right
kind of knowledge at the right time to enable them operate and maintain the existing plant operations at optimum levels and
- Integrate knowledge management efforts across the organization and improve the effectiveness of the learning system.

This practice was successfully designed, implemented, effectively utilized and its business impact measured in one world-scale plant 18 months ago. The effectiveness of the Learning Management System in that Plant improved to Level 5 (Return on Investment) from the earlier Level 2. Encouraged by the good results, the practice was replicated in 4 more World-scale Plants in the same location thereafter and the results have been uniformly encouraging. The Phase II of implementation in 2 more world-scale plants in the same location will be completed by December 2005. The Top Management has planned to replicate this practice in other locations also without making any changes. Phase III includes 30 world-scale plants in 2 other locations by December 2007 and the Phase IV includes 50 plants in 10 more locations by 2012.

1300 employees (72% of total employees in the respective plants) currently utilize this practice. They include employees at all levels - the plant operatives, engineers and managers.

Developing this practice required commitment of resources in terms of money, people and infrastructure. Developing of SC framework including the portal was done in a structured manner by forming various teams. The teams were involved in needs assessment, design, implementation and evaluation of the practice.

State-of-the-art high-speed servers were specifically procured for this purpose. These servers are loaded with IBM applications for various applications; Lotus notes utilities, domini.doc software for library management system. These servers are connected with users desktop/PC on fiber optic network to ensure best speed possible for access. Integration of various servers used for different applications, Distribution Control System, which monitors manufacturing plant operation, was done. The speed of access was checked right up to user PC located at farthest location. On-line help desk is introduced to address any issues/problem related to access control. It is decided to combine all frequently used applications on portal & created common icon on each PC/desktop for their mandatory use of SC. All employees of the company encouraged this concept.

In addition to above, study was carried out to find old PC’s & PC’s having low RAM. New PC’s & additional RAM cards were provided in strategic PC’s for fast access of portal.

The very purpose of developing SC was to bridge this gap. This practice is complimentary to the other KM initiatives and it is well aligned to other Learning management systems. The exhibit below illustrates the interaction between SC and training, learning and performance improvement systems.
Needs assessment was done by a group of new engineers, 15 junior level executives, 5 middle level executives, and 3 senior level executives from 7 plants along with one junior and one middle level executive from training functions. One person was nominated as overall coordinator for this project. Training, Technical Services along with Information Technology (IT) professionals, did design of the Framework. The same people who made the Needs assessment did implementation. Users did evaluation of the Framework from a cross-section of the organization at all levels (including 50 plant operatives (junior level) in various plants, 25 engineers (junior level), 10 managers (middle level) and two senior level executives in the plants and technical support services). The cost incurred towards development of SC framework (hardware and software) was US $ 300,000. While all plants at our location share the hardware cost, other plant-specific costs are booked to individual plant accounts. The return on investment works out to 112%.

It is an excellent case of quality & training functions transforming itself into a strategic business partner driving organizational results through creation of a conducive knowledge-sharing environment for application-focused learning. It is unique in terms of its design for continued relevance of learning to meet the changing business needs. This is done by capturing the knowledge of experts at various levels while experiencing success and failure learning and making it available to the knowledge seeker at the right time. Implementation of this practice has brought about a cultural change in the organization. The mindsets of the people have changed from knowledge hoarding to knowledge sharing and reuse. It has paved the way for application focused organizational learning systems developed by the employees and for the employees.

**MAJOR ACTIVITIES OF THE PROJECT:**

1. Formation of Team: Team comprising of sectional head of each discipline (Production/ Mechanical / Instrumentation / Electrical / Quality control Technical services / Central Engineering Services / IT) was formed.
2. Visit To Companies Like Du-Pont, INFOSYS & GE
3. Identification Of The Server, Identification of The Software / suitable IT platform
4. Designing The Portal (Designing of Taxonomy of database, Designing of Home Page, Uploading all Soft Copies To The Portal)
6. Uploading of Soft copies of documentation
7. Networking of various application servers, Distributed Control Systems, different portals
8. Training to all engineers, new graduate engineers & Technicians / Operators and their Validation
9. Estimation of benefits (Quality, yield & Productivity) & Forward Plan

**EVALUATION STRATEGIES & METHODS OF BENEFITS CALCULATIONS:**

The effectiveness of this practice is evaluated through a structured mechanism using a multi-pronged approach. The evaluation is done viz-a-viz goals of this practice. The goals of this practice as envisaged initially were:

a. Empower the relatively less experienced employees with the success and failure learning of the experts.

b. Integrate the knowledge & integrated quality management
efforts across the entire organization.

c. Improve the effectiveness of the learning & quality system by giving an opportunity to the employees acquire knowledge which they can apply in their workplace and which has a positive impact on the business results. This gives ultimately the Return on Investment.

d. Reduce cycle time for relocation of experienced personnel and induction of new personnel.

Some of the factors that have been considered for evaluation of this practice are

- Increase in production levels without corresponding increase in human resources or equipment capacity.
- Reduction in equipment failures or improvement in reliability
- Number of hits in identified portals that are the vehicles for Knowledge sharing.
- Reduction in lead-time for accessing documents those were in for the Seniors.
- Reduction in cycle time for problem solving or any improvement resulted by knowledge sharing.
- Reduction in lead-time for exchanging information with customers.
- Reduction in lead-time required for knowledge seekers to acquire the requisite knowledge.
- Reduction in lead-time required for an employee to take independent charge of a new position after his/her predecessor has moved away to a new position or a new assignment.
- Reduction in cycle time required for induction of a fresh employee into the organization.

These factors have a direct implication in improving the bottom line or profits. Other factors include enhanced involvement of employees in organizational improvement activities, reduced employee turnover, improved interpersonal relationships and consequent teamwork, and enhanced open communication and lower absenteeism.

Financial costs of this practice are calculated based on the cost of development of SC framework including the portal, cost to maintain the framework, cost of uploading the knowledge in electronic form and man power cost. The return on investment is 112%.

**Lessons learned from designing and implementing this practice is as follows:**

a) SC can be successfully implemented by not only creating the tools, but more importantly a conducive environment within the organization.

b) The relevance of learning framework needs to be continuously evaluated to ensure that it is aligned with the changing business needs. Creation and sustenance of effective learning & quality systems requires commitment from top management, sincere involvement of associates and alertness to changing business needs by the training professionals.

c) Knowledge generated in the minds of people needs to be captured and shared with all concerned on an ongoing basis. Its integration with the learning system will definitely improve training & quality
system effectiveness resulting in enhanced workplace place performance and bottom line.

d) Integration of isolated knowledge management efforts will add value to Business by providing complete learning solutions to all concerned employees for continuous improvement.

e) Knowledge sharing needs to be appropriately rewarded and recognized in order to create a culture that promotes the same. Technology alone cannot sustain knowledge sharing systems.

This practice is already replicated within the 5 world scale plants. A plan has been drawn to replicate this practice in 2 more world scale plants in the same location and 70 world scale plants in 12 other locations as the benefits that have resulted can be compounded several times. We would be willing to share the road map for implementation of SC with any organization in the spirit of truly being a world-class learning organization.

The information, which supported the fact that the organization has achieved the results of implementing the new practice of learning & integrated quality management system are given below.

BENEFITS:

The new practice was implemented since January 2004 and the comparative figures are given for the periods as follows: ‘Before’ implementing the practice: March 2003.

- During ‘Launch’ of the practice: January 2004
- ‘After’ implementing the practice: March 2005

The Business results of implementing the new practice, which have a direct and long-term implication in improving the bottom line or profits of the organization, are as follows:

a) Increased Employee Productivity

Effective decision-making and job planning, together with faster problem solving, due to easy and timely availability of expert knowledge, has resulted in improved Employee productivity. People productivity (MT of product/ Employee) has increased by 13.8 % in March 2005, as compared to 9.3 % in March 2004. The site has recorded the highest production in all its plants during 2004-05.

<table>
<thead>
<tr>
<th></th>
<th>Before</th>
<th>Launch</th>
<th>% Increase</th>
<th>After</th>
<th>% Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>430</td>
<td>470</td>
<td>9.3%</td>
<td>535</td>
<td>13.8%</td>
</tr>
</tbody>
</table>

b) Reduced Conversion cost

Enhanced participation in various organizational improvement activities has resulted in reduction of conversion cost in all the plants. Conversion cost (US $/ MT of product) was reduced in the largest plant, by 4.0 % in March 2005, as compared to 0.6 % in March 2004.

<table>
<thead>
<tr>
<th></th>
<th>Before</th>
<th>Launch</th>
<th>% Reduction</th>
<th>After</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>140.7</td>
<td>139.8</td>
<td>0.6%</td>
<td>134.3</td>
<td>4.0%</td>
</tr>
</tbody>
</table>

c) Reduced Utility consumption

Due to reasons mentioned in (b), specific consumptions of Power and Steam
in plant P1 have reduced by 6.4% and 34.2% respectively in March 2005, as compared to 1.1% and 7.3% respectively in March 2004.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Before</th>
<th>Launch</th>
<th>% Reduction</th>
<th>After</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power (KWH/MT)</td>
<td>440</td>
<td>435</td>
<td>1.1%</td>
<td>407</td>
<td>6.4%</td>
</tr>
<tr>
<td>Steam (MT/MT)</td>
<td>0.905</td>
<td>0.839</td>
<td>7.3%</td>
<td>0.552</td>
<td>34.2%</td>
</tr>
</tbody>
</table>

**d) Improved Equipment Reliability/Productivity**

After the implementation of the practice, the time required to locate and retrieve the emergency spares of the equipment reduced by 60-70%. On an average, emergency spares can be located in 15 minutes, with the help of information available online. This helped in reducing the cycle time of any problem solving considerably. In plant P1, number of equipment failures have reduced by 10.2%.

<table>
<thead>
<tr>
<th>Equipment failures</th>
<th>Before</th>
<th>After</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1022</td>
<td>917</td>
<td>10.2%</td>
</tr>
</tbody>
</table>

The maintenance cost has been reduced in Plant P1. (in million US $)

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<tr>
<th>Before</th>
<th>Launch</th>
<th>% increase</th>
<th>After</th>
<th>% reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.95</td>
<td>13.26</td>
<td>33.3%</td>
<td>11.32</td>
<td>14.6%</td>
</tr>
</tbody>
</table>

**e) Reduced Inventory cost**

Inventory (Million US $) in the plants have been reduced by 10.4%, in March 2005.

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<tr>
<th>Before</th>
<th>After</th>
<th>% Reduction</th>
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<tbody>
<tr>
<td>29.75</td>
<td>26.64</td>
<td>10.4%</td>
</tr>
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</table>

**f) Increased Contribution/Profit**

The improvement in the processes and equipment reliability and reduction in various costs as a result of changes in people behavior has improved the contribution/profit for the organization. Contribution (Million US $) of the site has improved by 7% in March 2005, as compared to 5.8% reduction in March 2004.

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<thead>
<tr>
<th>Before</th>
<th>Launch</th>
<th>% Reduction</th>
<th>After</th>
<th>% Increase</th>
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</thead>
<tbody>
<tr>
<td>199.7</td>
<td>188.2</td>
<td>5.8%</td>
<td>201.4</td>
<td>7.0%</td>
</tr>
</tbody>
</table>

**g) Improved Quality, Yield and First time on-specification products (without rework/recycle)**

The easy and timely availability of expert knowledge and enhanced customer focus have resulted in improved yield and first time on-specification products. In plant P2, both the yield and first time on specification products have improved, as compared to those in the previous 2 years:
h) Enhanced Involvement in Organizational improvement

Due to enhanced sense of belongingness to the organization, there has been active participation at all working levels in the form of Suggestions for improvement. No. of suggestions has increased by 180% in March 2005, as compared to 81.6% increase in March 2004:

<table>
<thead>
<tr>
<th>Before</th>
<th>Launch</th>
<th>% Increase</th>
<th>After</th>
<th>% Increase</th>
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</thead>
<tbody>
<tr>
<td>87</td>
<td>158</td>
<td>81.6%</td>
<td>443</td>
<td>180.0%</td>
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</table>

i) Reduced Employee unauthorized absenteeism

Employee Absenteeism has got reduced from 0.5% in March 2004, to 0.4% in March 2005 - a 20% reduction in unauthorized absenteeism.

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<th>Before</th>
<th>After</th>
<th>% Reduction</th>
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<tbody>
<tr>
<td>0.5%</td>
<td>0.4%</td>
<td>20%</td>
</tr>
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</table>

j) Product quality and enhanced Customer Satisfaction

The quality report of raw materials, intermediates and products are made available on LIMS (Laboratory Information Management System) under SC. This has resulted in 30% reduction in time taken for Process operators to communicate with Laboratory Chemists, enabling them make timely decisions on maintaining or changing process parameters, required to achieve desired quality of product. The use of LIMS has reduced the recycling of one product by 20%, during start-up of the plant. Product quality can also be viewed by the internal customers through a software titled IP 21, available on SC, which collects instantaneous data from D.C.S. (Distributed Control System) in the Control Rooms.

No. of Customer Complaints in plant P2 has come down from 45 in March 2004, to 40 in March 2005 - a reduction of 11%.

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<th>Before</th>
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<th>% Reduction</th>
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<tbody>
<tr>
<td>45</td>
<td>40</td>
<td>11.0%</td>
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k) Reduced waste generation

100% availability of documentation online has helped in reducing requirements of hard copies and hence the paper waste has got reduced by 25%. This has also resulted in 20% reduction in hard disc space requirements for all the employees’ computers. Presently, computer hard disc space is optimally utilized, after the implementation of SC.
Waste generation in the plant P2 has come down by 30.1%, in March 2005.

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<th>Before</th>
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<th>% Reduction</th>
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<tbody>
<tr>
<td>59.8</td>
<td>41.8</td>
<td>30.1%</td>
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</table>

l) Reduced cycle time for problem solving

The availability of 100% of documents online has enabled an employee to locate documents (manuals, standard operating procedures, handbooks, standards) at any location in the organization in 70% less time, as compared to the time required before implementing the practice. This in turn has reduced the cycle time for any problem solving substantially.

m) Reduced time required for Shutdown Planning

SC enabled employees know previous Shutdown experiences in the plant, shutdown budgets, manpower requirements, safety performance, contractor details and their performances. This has reduced the time required for retrieving the history of previous shutdown reports by 50% and overall cycle time in shutdown planning by 70%.

n) Reduced time required for induction of new employees

In our multi-location organization, where experienced employees are re-located at regular intervals, the organic (evolving) knowledge of experts has been made available to new employees through SC. This enabled new employee get inducted to the organizational practices within a shorter time, as compared to the time required before the new practice was in place. There has been a 66% reduction in time required for induction of new employees.

o) Reduced cycle time for Start-up

The cycle time for start-up operations for the entire location was reduced from 30 days to 12 days - reduction by 60%.

CONCLUSION:

Following objectives were achieved by implementing Structural Capital project.

1) Applied the Structural Capital framework to develop an integrated solution which will improve the process quality & operating performance
2) Evaluate the impact and use of technology in performance improvement.
3) Increase in Company’s repository
4) Integration of various activities, portals, systems enabled helped management & company for over all improvement of yield, quality & training effectiveness

: Results given under benefits section is clearly indicates the success story/achievement of the SC project.