Examination of Quality Concepts and Their Value: Developing the Ground for a Better Convergence between Quality Management and Systems Thinking in the US Shipbuilding

Student of Doctor of Business Administration (DBA) Program: Tatyana Ishutkina

The Centre for Innovational Development (CID) is a business community, bringing together technical - implementational knowledge, development of innovational technologies and creative associations of representatives from academia, the government and the Customer (in a stage of establishing)

Consultant part is supported by Worcester Polytechnic Institute
Expert part is supported by Massachusetts Institute of Technology

November 17, 2011
Outline

- Words – postulates:
  - Quality – Shipbuilding – USA
  - *travel reimbursement from the SPS for the presenters*
  - *research paper from the experienced shipbuilders (20 years and +)*
  - *academic work of industry representatives despite the age*

- A short review of the relevant literature that intellectually locates the research: Quality – Systems Thinking - Shipbuilding – Value

  .....slide 3 - 10

- Analysis of research work directions in the shipbuilding industry through complex approach and modeling in the aspects of the selected concepts of quality and management style

  .....slide 11 - 18
Research Questions: Introduction

Value

Systems Thinking

Quality

Shipbuilding

E. Deming
J. Juran
K. Ishikawa
A. Feigenbaum
S. Shingo
T. Ohno

???????

O. Turan
D. Andrew
M. Harrison
E. Frankel
J. Schank
P. Wells
K. Cooper

M. Jackson
J. Mingers
P. Checkland
M. Pidd
D. Lane
S. Beer
N. Weiner

T. Conti
R. Pirsig
M. Jackson
B. Richmond
R. Flood
J. Gharajedagh
P. Senge
K. Warren
Research Questions: Quality Element

Statistical process control
Planning for quality
Quality circles
Fishbone diagram
Poka Yoke
Just in time
Cost modeling
Lean
6Sigma
Systems Engineering

E. Deming
J. Juran
K. Ishikawa
A. Feigenbaum
S. Shingo
T. Ohno

(based on Conti, 2010)
- Neutral attribute
- Significance
- Expected value
- Perception of quality=weighted sum of the perceived value relative to the interesting qualities

Kano's model of customer satisfaction:
- Indifferent quality
- Attractive quality
- One-dimensional quality
- Must-Be Quality
- Concept of quality is linked to the concept of relationship

(from Dörfler, 1999)

Relevant details
Research Questions: Systems Thinking Element

(based on Checkland, 1983)

Scope of Literature Review

Hard Systems Thinking Methodology (HSTM)

- Type 1 Systems
  - situations characterized by interconnections which are part of the regularities of the universe
  - Publicly testable
  - Natural system

- Type 2 Systems
  - situations characterized by interconnections which derive from the logic of situations
  - Designed system

Soft Systems Thinking Methodology (SSTM)

- Type 3 Systems
  - situations in which interconnections are cultural, situations dominated by the meanings attributed to their perceptions by autonomous observers
  - NOT Publicly testable
  - Human activity system

HSTM was developed in 50s for addressing situations in Type 2 systems.

Today HSTM is applied to address situations in Type 3 systems.

Tomorrow SSTM must be applied for addressing situations in Type 3 systems.

M. Jackson
J. Mingers
P. Checkland
M. Pidd
D. Lane
S. Beer
N. Weiner

- Black box technique
- Feedback
- Management cybernetics
- Non-mechanistic
- Non-organism like
- Socio-behavioral
- Emergent properties
- Human factor
- Soft systems thinking
- Cognitive mapping

 Relevant details
Research Questions: Shipbuilding Element

Scope of Literature Review
This diagram will be used to increase communication effectiveness with mgt in the shipbuilding industry during the project to determine if it a tool that is:
- ideal
- standard
- not-realistic
The results will be used as one of the major factors for:
- introduction of human factor in the existing quality management system
- development of a new understanding of quality value
- stabilization of customer requirements for quality management in the industry

- Human entropy
- Self-organizing industry
- Distinctive military world ("islands of prosperity")
- Traditionalism
- Methodologies used in other countries
- Design (engineering, architectural, systemic, art design)
- Lack of education among management in engineering, manufacturing and mgt
- Competitiveness

Relevant details
Research Questions: Value Element

(based on Conti, 2010)

Scope of Literature Review

- Can be a plus sign
- Can be a minus sign
- Perception of value = valuation of certain qualities of a subject prepared by comparing the perceived value with expected value

For each “quality” ratio Vp/Ve (the ratio between perceived and expected value may be greater or less than 1

- When we say: "This subject has a high level of quality", we mean the following: "I attach great value important for me in the qualities of the subject."

- But in addition to consumer analysis of the "significance" should be required to hold providers, as customer satisfaction - and their loyalty - depends on the impressions from the product after purchase
1. Develop framework for reviewing models of quality management in the US shipbuilding industry through traditionalism – This task involves characterizing the current industry quality system and capabilities qualitatively and quantitatively, as well as examining how the industry quality system, capabilities, and business environment have changed over the past several decades.

2. Develop more robust models for quality system in the shipbuilding industry that will provide a stimulation of penetration of systems thinking in quality management—This task justifies a need to introduce systems thinking to quality management to understand the links between quality and value in the non-commercial sector of US shipbuilding and advise on future training needs informed by results.

➢ Lack of well developed theoretical framework
This research do not intend to discover universal laws, but it focus on explanation, understanding and interpretation of links between quality and value. Many of the uncertainties with which we deal in quality, are due to a lack of this understanding.
The Contribution of the Research Question

Introduce beginning concepts for understanding specific cause-effect of human/social relationships between persons and groups of persons in quality management in organizations through:

- introduction of multidisciplinary education in the existing quality management system
- development of understanding of quality-value relationships
- stabilization of customer requirements for quality management in the industry
**Analysis of research work directions in the shipbuilding industry through complex approach and modeling in the aspects of the selected concepts of quality and management style**

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</thead>
<tbody>
<tr>
<td>P05 A Very Simple Model of the distortion of light-weight ship structures</td>
</tr>
<tr>
<td>P06 Low Cost Virtual Welding System</td>
</tr>
</tbody>
</table>
Fran Ackermann's Tear Drops: Group Map

'the aggregation of cognitive maps' or group map → the structure of the final strategy

Aspiration System

EMERGENT GOALS

STRATEGIC ISSUES

constructs or statements

STRATEGIC PROBLEMS

OPTIONS

'tear-drops' of explanatory statements

Aspirations/Goals

Supports

Strategies

Supports

Strategic Programmes

Supports

Strategic Actions portfolios

The JOURNEY
# SPS Papers - Aggregation

## SPS Presentations & SPS Paper Sessions

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<th>P21 Shipyard Electrical Safety Awareness Program</th>
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<tr>
<td>P06 Low Cost Virtual Welding System</td>
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<td>P26 Mobile Solutions Supporting System Certification for Navy Shipbuilding Programs</td>
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<td>P13 Implementing 3D for ship production and overhaul using 3D Work Instructions</td>
<td>P16 The productivity of naval dockyards and opportunities for improvement</td>
<td>P20 Guidelines for using titanium seawater piping in large shipboard marine structures</td>
<td>P38 Using the Ship’s Information Model to Support Post Erection Planning, Compartment Close-out and Systems Testing</td>
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<tr>
<td></td>
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<td>P42 Conceptual development of structured bill of material (BOM) for the logic based product lifecycle management (LBPLM) system for shipbuilding industries</td>
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## GOAL

**P27** Examination of Quality Concepts and Their Value: Developing the Ground for a Better Convergence between Quality Management and Systems Thinking in the U.S. Shipbuilding

## STRATEGIES

- P02 Shipyard Development and Overall Design
- P04 Completion and Validation of the Ship Common Information Model (SCIM)
- P05 A Very Simple Model of the distortion of light-weight ship structures
- P06 Low Cost Virtual Welding System
- P13 Implementing 3D for ship production and overhaul using 3D Work Instructions

## ISSUES

- P21 Shipyard Electrical Safety Awareness Program
- P17 Uniform-Panel Weld Shrinkage Data Model for Neat Construction Ship Design Engineering
- P18 Corrosion Resistant Nanocomposite Pretreatment Coating for Marine Structures
- P07 Low Cost Pultruded Composite Ship Structures
- P16 The productivity of naval dockyards and opportunities for improvement

## OPTIONS

- P30 3D-PDF Create Consume Share Ubiquitous Information Sharing
- P29 Container Stowage Planning for Mobile Harbor A1-250
- P12 A Math-Based Design-for-Produceability Evaluation of Titanium Applications in Ship Hull Structures
- P26 Mobile Solutions Supporting System Certification for Navy Shipbuilding Programs
- P20 Guidelines for using titanium seawater piping in large shipboard marine structures
- P16 The productivity of naval dockyards and opportunities for improvement
- P18 Corrosion Resistant Nanocomposite Pretreatment Coating for Marine Structures
- P07 Low Cost Pultruded Composite Ship Structures

## P34 A New Paradigm for Quantitative Non-Destructive Evaluation and Material State Awareness in Marine Structures

**P42** Conceptual development of structured bill of material (BOM) for the logic based product lifecycle management (LBPLM) system for shipbuilding industries

**P45** Product Asset Lifecycle Management System supported by Product Embedded Information

**P40** Motion Response of Flat Bottom Pipelay Barges with Large Stingers
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<th>OPTIONS</th>
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<td><strong>P27</strong> Examination of Quality Concepts and Their Value</td>
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<td><strong>P36</strong> Production Engineering Management Tools</td>
<td><strong>P04</strong> Completion and Validation of the Information Model</td>
<td><strong>P18</strong> Pretreatment Coating for Marine Structures</td>
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<td><strong>P42</strong> bill of material (BOM) for product lifecycle management</td>
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**P45** SPS Presentations & SPS Paper Sessions
Three Kinds of Thinking Process by Kenichi Ohmae
Financing Research Work by the Company's Employees

"Award for ..." remains in the company fund (the Researcher proposes to consider it through the Centre for Innovational Development (research work by a company employee)). The recipient disposes of that money for investment within the company, and if it yields economic benefits, then 20% of the yield goes to the investor/award recipient.

Words-Postulates: Award for...; Company fund
Words – postulates:
Quality – Shipbuilding – USA
travel reimbursement from the SPS for the presenters
research paper from the experienced shipbuilders (20 years and +)
academic work of industry representatives despite the age

The strategy is as follows:
There is a responsibility of the management to assign certain positions according to the qualifying range of direct responsibilities for a manager or an engineer.
There is a salary remuneration for this responsibility
Delivery of product
a) defect-free
   b) in time
- the main criteria for paper development under the current situation ...

19
Financing Research Work by the Company's Employees – cont'd

- the main criteria for research paper development offered by the Researcher and
- the main criteria for academic work development offered by the Researcher are as follows:
In the process of work, a manager or an employee writes a research paper in which the selected concepts of quality and management style are justified according to the tool set that has been used, and provides an understanding of the tool set development, or the need for its reduction, including the possibility of its elimination.
In the process of work, a manager or an employee writes an academic paper in which the selected concepts of quality and management style are justified according to the tool set that has been used, and provides an understanding of the tool set development, or the need for its reduction, including the possibility of its elimination.
He funds the work in the direction of the research through his award.

As a result, there appear:
1. An individual career development schedule for each employee
2. Development and establishment of different styles of management in the company
3. A competitive mode of work in the company
4. A necessary part of each contributor's work will be defense of their work before a screen, advertising, competition, defense of themselves and their concepts through research - and this means a dialogue between the management and the employees at a more modern level
5. The team endorses the proposal and/or takes part in determining the direction of continued research, or offers an alternative direction. This introduces an element of transparency in the competitive process.
Financing of Research Work by the Company

Budget Support Information

Personnel: Researcher / Consultant / Expert

Fringe benefits based on negotiated indirect rate.

Note. The above sample is for illustrative purpose to serve as one example of the type of minimal detail and rationale needed in order to assist researcher in determining cost reasonableness. Typically, the more effectively the researcher can detail, support and link costs to their proposed project, the more streamlined negotiations will proceed. Organization/industry representative will advise researchers on needed cost information during proposed award negotiations.
Back-up
References


References


References

SPS Presentations & SPS Paper Sessions,
http://www.sname.org/Go.aspx?NavigationKey=926545f9-f576-4a73-8649-3edc1f5efad0,
accessed on November 12, 2011

Sage Publication, London


http://www.google.com/imgres?
hl=en&biw=855&bih=476&tbnm=isch&tbnid=NLML2oHbRWiAv4M:&imgrefurl=http://pkl.net/~
node/2RCD/TribalRevival/index.html&docid=eAYs_6VXG9jrdM&imgurl=http://pkl.net/~nod
e/2RCD/TribalRevival/tribalcentreL.jpg&w=700&h=461&ei=tQzATp2OKc6b0QHEm4n0BA&
zoom=1&iact=rc&dur=413&sig=112097615465623229609&page=2&tbnh=106&tbnw=161
&start=9&ndsp=9&ved=1t:429,r:5,s:9&tx=113&ty=55

http://pkl.net/~node/2RCD/TribalRevival/index.html
represents quality aspects in the shipbuilding industry to the industry, government, and educational institutions
specializes on quality concepts (analysis of the existing quality concepts in conjunction with the company's strategy)
sees development of the quality concepts through styles of quality management
focuses her research on reviewing strategy of quality management:
at the genetic level. To identify concepts for developing a common DNA between existing technologies used by the
quality management and working environment of the employees in the US Shipbuilding industry at the present
moment when degradation of the quality tools is taking place in the existing paradigm of quality concepts
by establishing a common DNA within quality management styles and across different quality concepts
by establishing a common DNA between quality management styles and specific products produced by the company
has overall experience in the shipbuilding industry for almost 20 years
uses systems thinking as a methodology for academical basis to represent quality topics
her academical background is:
(2009 -present) Doctor of Business Administration (DBA) program in Management Science in University of
Strathclyde Business School, Glasgow, Scotland
(2000-2002) MSc in Administrative Studies from Boston College. Chestnut Hill, MA
(1997-2000) BA in Administrative Studies from Boston College, Chestnut Hill, MA
(1976-1981) MSc in Electrical Engineering from N. Novgorod State University, Nizhny Novgorod, Russia
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Surpassing the Ordinary - Accomplishing the Extraordinary