Introduction

To partial fulfillment of the requirements for the degree of Master of Business Administration in Information Management at the Newport Business Academy and Newport International University, I decided to work out a research proposal with the title:
"Selection and decision-making criteria for a Distributed Control Systems in the process industry".

The project framework

For the control of the chemical processes in the process industry Distributed Control systems (DCS) are applied. These systems are the heart- and nerve system within these factories. The choice of DCS for a concern is a matter of strategic importance.
High demands are made to the availability of a DCS and if the concern made a choice, she is committed to it for a lengthy time. Replacing a DCS is a very valuable matter because of the arisen production loss at a reconstruction for example. The service costs of a DCS could be a multiple amount of the initial investment during the life span.
The process industry in the world for approximately spends 45.8 billion dollar per year at the top 50 suppliers on process control systems (included DCS).

Study

Define the core selection criteria and their priorities for the purchase of a Distributed Control system (DCS) in the chemical industry and a design a decision-making model so that the decision-making for new systems more balanced more consequent and faster can be carried out.

The goals of this research is

**The improvement of model-based consideration concerning a selection of a new distributed control system (DCS), by making an analysis of selected criteria within the "Process" industry to choose a DCS and to establish an investment/ selection model with these insights/ ideas.
So that future investment can be bought faster and the decision-making will be more transparent.**

The areas of the study

- What is the business case of your investment in a new DCS system?
- What is the reason for this investment (migration, replacement or a new installation) and what are consequences of the choice of system?
- Which DCS supplier knows the person who is concerned in the company purchase of a new system?
- What decides whether the DCS supplier comes on the Big List for further evaluation?
- What decides whether the DCS supplier comes on the Short List for further evaluation?
- Which staff functions are involved in the selection?
- At which components do these people pay attention and which priority do they give to the different components?
- Is there a difference between the ideas of DCS suppliers and users concerning these criteria?

Survey filled in by   : ……………………………………………….

Company name   :…………………………………………..

Country (your site location)   :…………………………………………….

What is your primary JOB TITLE   :…………………………………………..

What is your email address
             :…………………………………………..

Do you work for a central organization?   : YES/NO

Are you involved in the selection process for a DCS system : YES/NO

If not can you give me contact name in your organization :…………………………………………..
………………………………………………………

Do you want to receive to outcomes of this study?   : YES/NO

Postal Address   : …………………………………………….

                                         : …………………………………………….

                                         :…………………………………………….

I work in the Industry segment:

1. DCS Supplier
2. System integrator
3. Bulk Chemicals
4. Cement & Glass
5. Consumer goods
6. Fine Chemicals
7. Food en Beverage
8. Oil & gas exploration
9. Oil & gas refining
10. Pharmaceutical & Cosmetics
11. Electric Power (Generation, T&D)
12. Pulp & Paper industry
13. Refining   & Hydrocarbon Processing
14. Water treatment
15. Other industry   : …………………………………………………………………………

Please send this survey back to:

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ALL INFORMATION WILL BE TREATED CONFIDENTIALLY

For more information see www.dcsselect.eu

Voting / ranking (information)

Number	Description and comments Importance priority
1	Not important at all - No interest and no need
2	Not very important - Nice to have if easy to implement
3	Somewhat important - Nice to have
4	Important - Should have
5	Very important - Must have
6	Extreme important - Must have (knock-out criteria)
DK	Don't know
N/O	No opinion
N/A	Abstain, No interest and no objection

Question 1

Project type:
What was the project type and reason that you did the last DCS project?

Migration ☐

Expension ☐

Replacement ☐

Green field project ☐

Project DCS size (see table below) | SMALL / MEDIUM/ LARGE |

DCS Size Definitions

	Small	Medium	Large
Workstation	1-2	3-8	>8
Controllers	1-2	3-8	>8
Analog I/O Points	0-599	600-1499	1500 +
Digital I/O Points	0-299	300-799	800 +

Note : Workstations include operator and programming workstations, as well as application processors sold by the DCS supplier.

2 Involved people in the selection process

Which people in your company are involved in the selection process of a DCS, and what is there influence on the selection (Not /Minor/Major/Veto).

Job Title	Involved by big list	Involved by shortlist	Involved by final selection
CFO	Not /Minor/Major/Veto	Not /Minor/Major/Veto	Not /Minor/Major/Veto
CIO	Not /Minor/Major/Veto	Not /Minor/Major/Veto	Not /Minor/Major/Veto
Control engineer	Not /Minor/Major/Veto	Not /Minor/Major/Veto	Not /Minor/Major/Veto
Operator	Not /Minor/Major/Veto	Not /Minor/Major/Veto	Not /Minor/Major/Veto
Plant manager	Not /Minor/Major/Veto	Not /Minor/Major/Veto	Not /Minor/Major/Veto
Purchasing	Not /Minor/Major/Veto	Not /Minor/Major/Veto	Not /Minor/Major/Veto
Quality control department	Not /Minor/Major/Veto	Not /Minor/Major/Veto	Not /Minor/Major/Veto
Shift leader	Not /Minor/Major/Veto	Not /Minor/Major/Veto	Not /Minor/Major/Veto
Technology department (chemicals)	Not /Minor/Major/Veto	Not /Minor/Major/Veto	Not /Minor/Major/Veto
Training officer	Not /Minor/Major/Veto	Not /Minor/Major/Veto	Not /Minor/Major/Veto
Consultant from Head Quarter	Not /Minor/Major/Veto	Not /Minor/Major/Veto	Not /Minor/Major/Veto
Plant owner	Not /Minor/Major/Veto	Not /Minor/Major/Veto	Not /Minor/Major/Veto
Engineers firm	Not /Minor/Major/Veto	Not /Minor/Major/Veto	Not /Minor/Major/Veto
Solution provider	Not /Minor/Major/Veto	Not /Minor/Major/Veto	Not /Minor/Major/Veto
EPC	Not /Minor/Major/Veto	Not /Minor/Major/Veto	Not /Minor/Major/Veto
Maintenance manager	Not /Minor/Major/Veto	Not /Minor/Major/Veto	Not /Minor/Major/Veto
IT department	Not /Minor/Major/Veto	Not /Minor/Major/Veto	Not /Minor/Major/Veto
Maintenance technician	Not /Minor/Major/Veto	Not /Minor/Major/Veto	Not /Minor/Major/Veto
Others………… …..	Not /Minor/Major/Veto	Not /Minor/Major/Veto	Not /Minor/Major/Veto
Others………… …..	Not /Minor/Major/Veto	Not /Minor/Major/Veto	Not /Minor/Major/Veto

3) Overall Vendor Evaluation

Please distribute up to 100 points (total sum should be 100%)

primary evaluation criteria	primary evaluation criteria, Description	Impor tance % of total	Most important at (1 = high and 3 is low)		
			Big list	Sho rt list	final list
Business Case	Vendor guarantees that proposed solution will give the needed results for the business case.				
Functionality	Seamless integration between all control functions. Integrated support. Industry-specific application templates and industry process flows.				
Technology	Easy to use, simple to maintain. Effective user interface. Easy to integrate.				
Interoperability	To other systems outside the DCS				
Implementation process	Quick implementation focus. The user should choose a DCS vendor that uses experienced engineers, consultants, project management and a proven method to ensure quick implementation.				
Service and Support	Post-purchase support. Users should favour vendors that provide superior post-purchase user services such as responsive phone support, quality documentation (online and printed), online user-group discussions and web sites with diagnostic applications. Low-hassle life cycle management. Users should choose vendors with a track record of providing timely, easy-to-install upgrades with reasonable additions of new functionality and few "bugs.				
Training	Vendor training given to operators, maintenance and engineers				
Documentation	All standard and custom documentation (paper and Online) of the project and it interconnections.				
Viability	Strategy, Strong financials, marketing and good management. Vendors that rate high in viability have plenty of cash to spend on R&D and sales and marketing.. Rapid growth				
Vision	Future market focus. To be truly visionary, a vendor has to tie together all the characteristics of the industry needs. The vendor evaluations model and integrate the criteria into an achievable, cohesive, targeted and focused business plan with a palatable message.				
Initial cost	Initial costs include customization and consulting, education and training, managing the implementation of the product into the business, hardware, networking, communications and software (comprising the application package, database, systems software, network management and other software needed to run the product). Users also need to gain an appreciation for the process changes that must occur up front to make the system work.				
Ongoing costs	Ongoing costs include custom enhancements, education and training, maintenance payments, services and upgrades.				
Barrier to Exit cost	Barrier to Exit cost or switching cost, to a new technology after that the lifetime of this project and product.				
User experience	Have many excellent user references				
Sum - Total	Sum Should be 100%	100%			

4) COST - investment priorities

What cost evaluation -situation described the best your business decision for a new DCS system? Select a priority 1 = first choice and 8 is last choice.
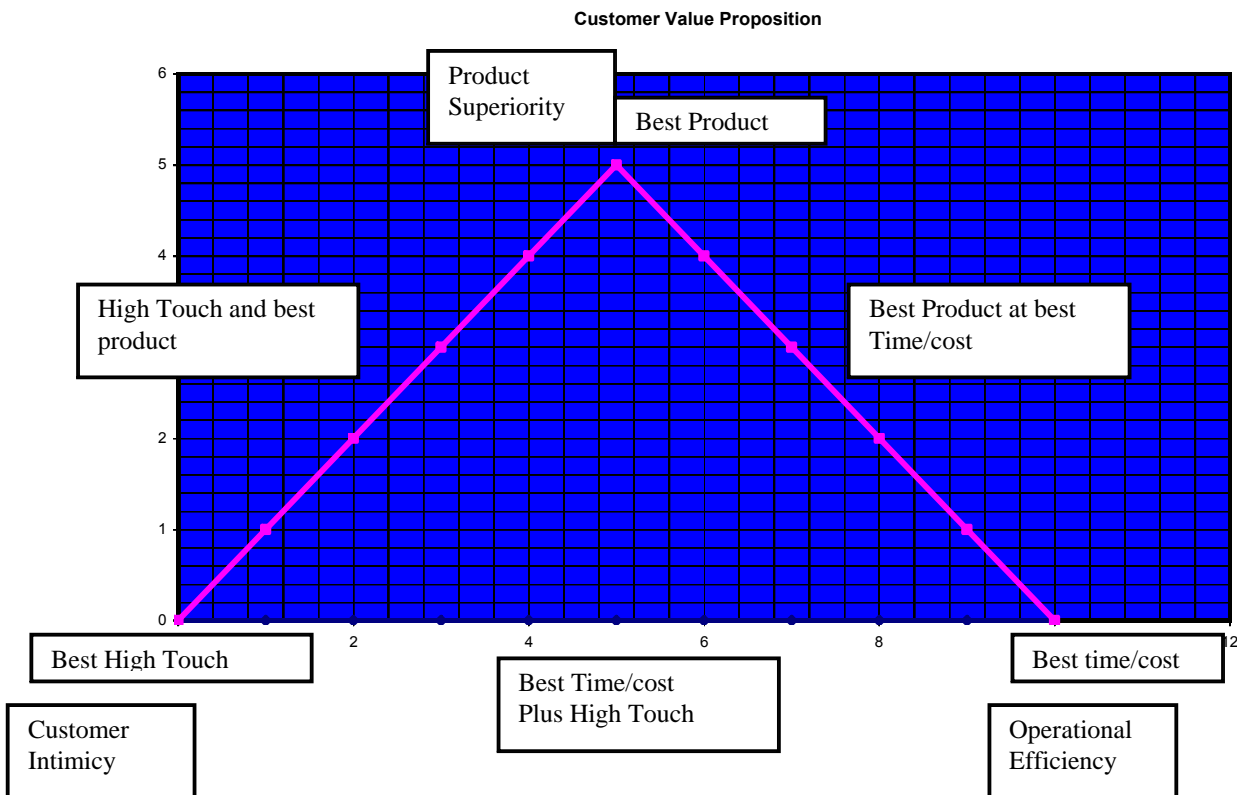
Item	Description	Priority 1-8
Purchase cost	The price that the Company has to pay to the vendor	
Initial cost	Initial costs include customization and consulting, education and training, managing the implementation of the product into the business, hardware, networking, communications and software (comprising the application package, database, systems software, network management and other software needed to run the product). Users also need to gain an appreciation for the process changes that must occur up front to make the system work.	
Ongoing costs	Ongoing costs include custom enhancements, education and training, maintenance payments, services and upgrades.	
Initial cost and ongoing costs for a period of 1 years	Initial costs include customization and consulting, education and training, managing the implementation of the product into the business, hardware, networking, communications and software (comprising the application package, database, systems software, network management and other software needed to run the product). Users also need to gain an appreciation for the process changes that must occur up front to make the system work and the ongoing costs include custom enhancements, education and training, maintenance payments, services and upgrades for one year.	
Initial cost and ongoing costs for a period of 3 years	See above for tree years.	
Initial cost and ongoing costs for a period of 5 years	See above for five years.	
Initial cost and ongoing costs for a period more than 5 years	See above for than five years.	
Exit cost or switching cost	Exit cost or switching cost are the cost that the company has to make when it switch to a newer technology. Functionality is possible locked into proprietary file formats, proprietary applications and a propriety programming environment, all of which create big barriers to exit.	

5) Customer Value Propositions

Please place a dot on the spot you think where your needs are for a DCS vendor or write the coordinates in the box.

For Electronic input: Please write the coordinates (like (X8 and Y 2)

X = …. , Y = ………

Customer Value Proposition

Product Superiority

Best Product

High Touch and best product

Best Product at best Time/cost

Best High Touch

Customer Intimicy

Best Time/cost Plus High Touch

Best time/cost

Operational Efficiency

6) Business case reasons

Put a "1" in the most apply field (cell).

Question	BIG LIST	SHORTLIST	FINAL	No Need	Nice to have if easy to implement	Nice to have	Should have	Must have	Must have (knock-out criteria)	Don't know	No opinion	Abstain
Business information to the plant floor												
Could not maintain old system.												
Create a more cost-effective process												
Efficient workflow												
Higher production												
Improve loop control												
Improve reporting												
Increase real-time decision making												
Increasing information for the workforce												
Larger production mix												
More people thinking in the big picture												
Need for a ease to use system												
Reduce complains of customers												
Reduce workforce												
Regulatory requirements												
Removal of manual processes												
Removal of redundant processes												
Replace obsolete systems												
Use of advanced control algorithms												
Improved product Yield												
Improvement of product Quality												
Improved Use of Raw Materials												
Reduction in Equipment Maintenance												
Improved Automation												
Improve accounting data												
Improve engineering data												
Increase in process knowledge												
Automatic Start-up and shutdown routines												

7) Technology

Is your company a trendsetter or more a follower?

☐ Trendsetter, new technology

☐ Industry follower, proven technology

When you buy hardware or software for a DCS system you will buy it at:

☐ We would like to be a beta test site

☐ After the first release of the product

☐ After one year of the first release of the product

☐ Later

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8) Decision making techniques in the selection process

Type	Descriptor	I know this	I use this
Pareto Analysis	Pareto analysis is a very simple technique that helps you to choose the most effective changes to make. It uses the Pareto principle - the idea that by doing 20% of work you can generate 80% of the advantage of doing the entire job. Pareto analysis is a formal technique for finding the changes that will give the biggest benefits. It is useful where many possible courses of action are competing for your attention.		
Paired Comparison Analysis	Paired Comparison Analysis helps you to work out the importance of a number of options relative to each other. It is particularly useful where you do not have objective data to base this on. This makes it easy to choose the most important problem to solve, or select the solution that will give you the greatest advantage. Paired Comparison Analysis helps you to set priorities where there are conflicting demands on your resources.		
Grid Analysis	Grid Analysis (also known as Decision Matrix analysis or Pugh Matrix analysis) is a useful technique to use for making a decision. Decision matrices are most effective where you have a number of good alternatives and many factors to take into account. The first step is to list your options and then the factors that are important for making the decision. Lay these out in a table, with options as the row labels, and factors as the column headings. Next work out the relative importance of the factors in your decision. Show these as numbers. We will use these to weight your preferences by the importance of the factor. These values may be obvious.		
Cost/Benefit Analysis	Cost/Benefit Analysis is a relatively simple and widely used technique for deciding whether to make a change. As its name suggests, to use the technique simply add up the value of the benefits of a course of action, and subtract the costs associated with it. Costs are either one-off, or may be ongoing. Benefits are most often received over time. We build this effect of time into our analysis by calculating a payback period. This is the time it takes for the benefits of a change to repay its costs.		

Type	Descriptor	I know this	I use this
Decision Tree Analysis	Decision Trees are excellent tools for helping you to choose between several courses of action. They provide a highly effective structure within which you can lay out options and investigate the possible outcomes of choosing those options. They also help you to form a balanced picture of the risks and rewards associated with each possible course of action. You start a Decision Tree with a decision that you need to make. Draw a small square to represent this towards the left of a large piece of paper. From this box draw out lines towards the right for each possible solution, and write that solution along the line. Keep the lines apart as far as possible so that you can expand your thoughts		
PMI	PMI stands for 'Plus/Minus/Implications'. It is a valuable improvement to the 'weighing pros and cons' technique used for centuries. PMI is an important Decision Making tool: the mind tools used so far in this section have focused on selecting a course of action from a range of options. Before you move straight to action on this course of action, it is important to check that it is going to improve the situation (it may actually be best to do nothing!) PMI is a useful tool for doing this.		
Force Field Analysis	Force Field Analysis is a useful technique for looking at all the forces for and against a decision. In effect, it is a specialized method of weighing pros and cons. By carrying out the analysis you can plan to strengthen the forces supporting a decision, and reduce the impact of opposition to it.		
Six Thinking Hats	'Six Thinking Hats' is an important and powerful technique. It is used to look at decisions from a number of important perspectives. This forces you to move outside your habitual thinking style, and helps you to get a more rounded view of a situation.		
Other 1 ………………..			
Other 2 ……………….			
Other 3 ……………….			

Research project 'Selection Criteria for a Distributed Control System"

9) Please mark the field of the company's when you think about DCS Vendor

Vendor	System	I know this company's product	I would select this company for a big list	I would select this company for a shortlist	We bought a control system from this company
ABB	Symphony (Harmony And Melody)				
ABB	Contronic				
ABB	Master Mod 300				
ABB	FreeLance 2000				
ABB (ABB)	Advant (MV, AC, OS)				
ABB (ABB)	Proctonic				
ABB (ABB)	Operate IT				
ABB (ABB)	Produce IT				
ABB (E.B.)	INFI 90				
ABB (E.B.)	INFI-RTU				
ABB (F&P)	DCI system Six				
ABB (SATT)	Satt-line				
ABB (SATT)	Sattgraf				
ABB (SATT)	Satt-con				
Alstom	Alspa P320				
Emerson	Ovation				
Emerson (Fisher Rosemount)	RS3				
Emerson (Fisher Rosemount)	Provox				
Emerson (Fisher Rosemount)	WDPF 2				
Emerson Process Management	DeltaV				
Fuji	MICREX-NX				
GE	Mark VI				
Hollysys	Hollias				
Honeywell	Experion PKS				
Honeywell	TPS				
Honeywell	Plantscape				
Honeywell	TDC 3000				
Honeywell	TDC 2000				
Honeywell	SMS				
Invensys	A2 System				
Invensys (Foxboro)	IA Series				
Invensys (Foxboro)	Spectrum				
Metso	Metso DNA				
Metso	Max DNA				
Metso	Damatic				
Metso	MAX				
Metso	Valmet XD				
Metso	Valmet Classic				
Mitsubishi	Diasys Netmation				
Rockwell Automation	Process Logix				
RTP Corporation	2300/2500				
Siemens	PCS-7				
Siemens	Teleperm				
Siemens	APACS				
Siemens	S5				
Siemens	S7				
Siemens	Win CC				
Supcon	ECS-100				
Supcon	JX-300X DCS				
Toshiba	TOSDIC CIE DS				
Xinhua Control	XDPF-400				
Yamataka	A-MC				
Yokogawa	Centum				
Yokogawa	CS				
Yokogawa	Stardom				

Remarks and tips for the researcher:

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