Information Assurance in Networked Enterprises: MICSS Class Experiments and Industry Survey Analysis

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MICSS Class Experiments and Industry Survey Analysis[1]

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ABSTRACT

Two surveys have been developed to ascertain the information assurance requirements of networked enterprises. The surveys give an insight into how inter-networked companies use their ERP systems, what their current policies maybe with respect to information management, and what their security and assurance problems maybe.

The surveys focus on the views of the information manager of the firm and on the department managers of those departments that depend mostly on their information systems for smooth running.

The survey questions have been based on quantitative analysis done by experiments using an ERP software simulator, MICSS (Management Interactive Case Study Simulator). The logic and procedures used to develop the surveys has been presented. The results obtained from the analysis of the survey replies will enable the design of autonomous agents and active protocols to help companies automatically assure their information.

PART A

<u>Design of Experiment:</u>
We have decided to study 4 factors in this experiment.

Factor 1:
Dataset; with 4 levels: Prices, QLT (Quoted Lead Time), Batch Size, and Order Levels.
Factor 2:
Failure type; with 2 levels: "wrong information", and "delayed information"
Factor 3 (nested in "wrong information"):
Error size; with 2 levels "value doubled", and "value halved".
Factor 4 (nested in "delayed information"):
Length of delay; with 2 levels "1 quarter", and "2 quarters".

The observations haven't been analyzed like a nested design. We didn't need all the information given by a nested design analysis. For simplicity and time saving, we have used single ANOVAs to compare each time two different scenarios.

For each dataset, the following comparisons are presented:
Dataset delayed 1 quarter / Baseline policy (for profit).
Dataset delayed 2 quarters / Baseline policy (for profit).
Dataset wrong half / Baseline policy (for profit).
Dataset wrong double / Baseline policy (for profit).

The datasets are presented in this order: Prices, QLT, Batch Size, Order Level.
Analysis on the DDP could not be done because of unavailable data.

<u>Summary:</u>
Prices
    Fig.A1 - Dataset delayed 1 quarter / Baseline policy (for profit).
           Dataset delayed 2 quarters / Baseline policy (for profit).
    Fig.A2 - Dataset wrong half / Baseline policy (for profit).
           Dataset wrong double / Baseline policy (for profit).
QLT
    Fig.A3 - Dataset delayed 1 quarter / Baseline policy (for profit).
           Dataset delayed 2 quarters / Baseline policy (for profit).
    Fig.A4 - Dataset wrong half / Baseline policy (for profit).
           Dataset wrong double / Baseline policy (for profit).
Batch Size
    Fig.A5 - Dataset delayed 1 quarter / Baseline policy (for profit).
           Dataset delayed 2 quarters / Baseline policy (for profit).
    Fig.A6 - Dataset wrong half / Baseline policy (for profit).
           Dataset wrong double / Baseline policy (for profit).
Order Level
    Fig.A7 - Dataset delayed 1 quarter / Baseline policy (for profit).
           Dataset delayed 2 quarters / Baseline policy (for profit).
    Fig.A8 - Dataset wrong half / Baseline policy (for profit).
           Dataset wrong double / Baseline policy (for profit).

Notations:

"D" means: The two scenarios give significantly different results.

"D –" means that the performance with information failure, for profit or DDP, is worse than with the baseline policy.

"D +" means that the performance with information failure, for profit or DDP, is better than with the baseline policy.

"S" means: The two scenarios give significantly similar results.

Fig.A1 – Prices;
Dataset delayed 1 quarter / Baseline policy (for profit)
Dataset delayed 2 quarters / Baseline policy (for profit)

Table A1

	QTR 1	QTR 2	QTR 3	QTR 4
2 qtr delay vs. correct	D-	NA	NA	D-
1 qtr delay vs. correct	D-	D-	D-	D-

Fig. A1 shows that a delay in Prices affects the Profit in a significant manner. The data for quarter 2 and 3 for a two-quarter delay is missing and hence not plotted. Table A1 summarizes the effects of delayed information on prices.

Fig.A2 – Prices;
Dataset Wrong half / Baseline policy (for profit)
Dataset Wrong double / Baseline policy (for profit)

Table A2

	QTR 1	QTR 2	QTR 3	QTR 4
Double vs. correct	S	D+	D+	D+
Half vs. correct	S	D+	D+	D+

As seen from Fig. A2, the amount by which the prices are changed is insignificant, the effect is essentially the same. The range analysis shows that the ranges are the same.

Fig.A3 – QLT;
Dataset delayed 1 quarter / Baseline policy (for profit)
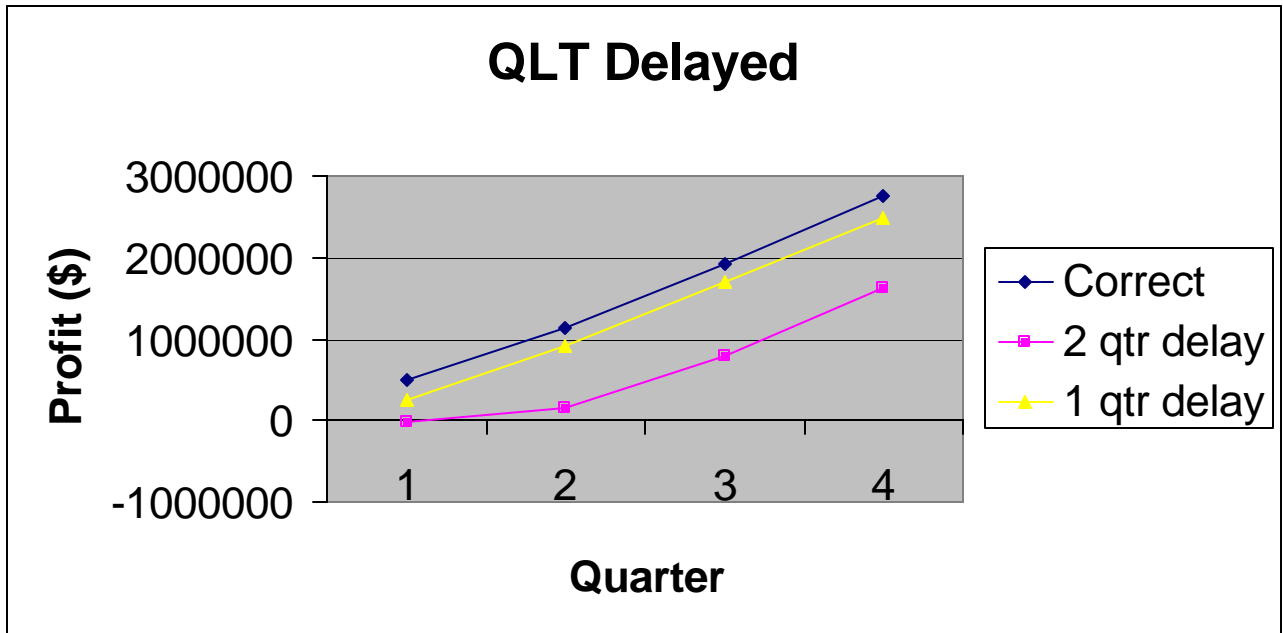*Dataset delayed 2 quarters / Baseline policy (for profit)*

Table A3

	QTR 1	QTR 2	QTR 3	QTR 4
2 qtr delay vs. correct	D-	D-	D-	D-
1 qtr delay vs. correct	D-	D-	D-	D-

Fig. A3 shows that a delay in QLT affects the Profit in a significant manner. There is a significant decrease in the Profit if the information is delayed a quarter/two quarters. The effects are summarized in Table A3.

Fig.A4 – QLT;
Dataset Wrong half / Baseline policy (for profit)
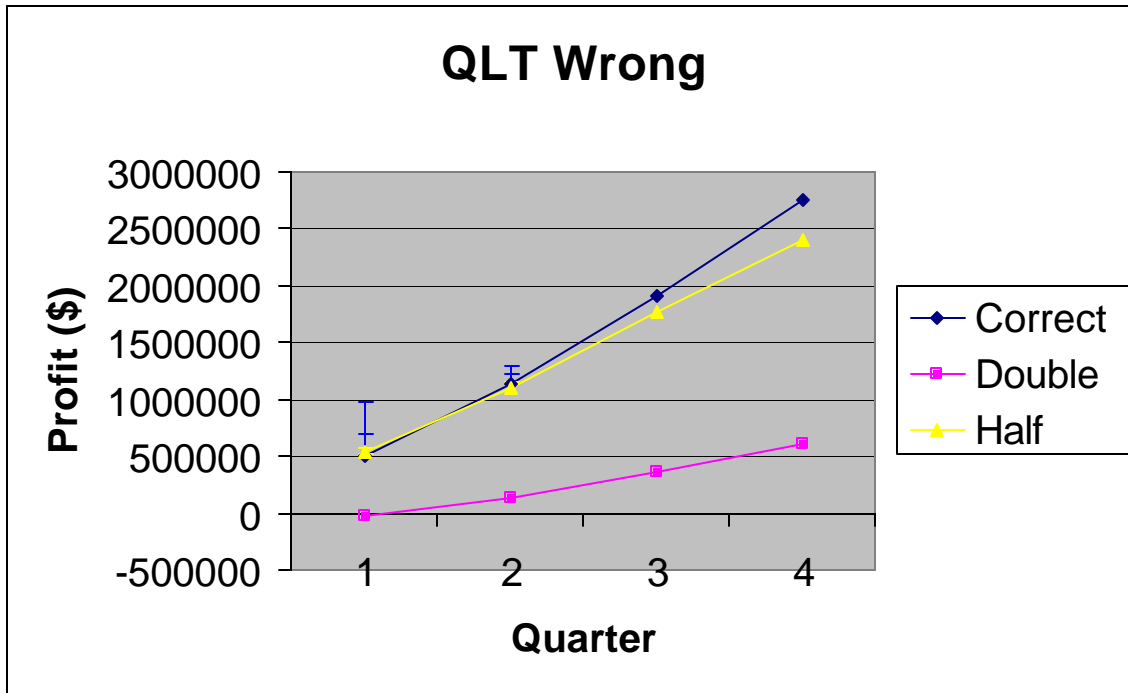*Dataset Wrong double / Baseline policy (for profit)*

Table A4

	QTR 1	QTR 2	QTR 3	QTR 4
Double vs. correct	D-	D-	D-	D-
Half vs. correct	S	S	D-	D-

It can be seen from Fig. A4 that a larger error in value can cause a major decrease in profit, however a small change will affect it only in the long run. A range analysis shows that the half and correct values are actually almost the same for the first 2 quarters. Ranges are shown only for those quarters where the averages are very close. This is done to see if the ranges of the information overlap or not.

Fig.A5 – Batch Size;
Dataset delayed 1 quarter / Baseline policy (for profit)
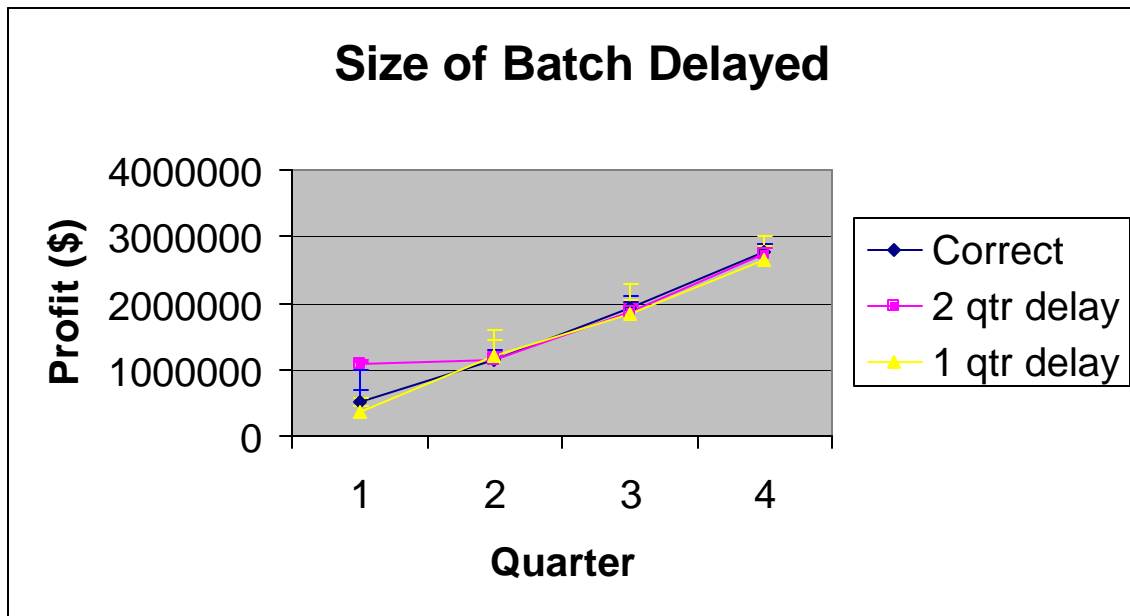*Dataset delayed 2 quarters / Baseline policy (for profit)*

Table A5

	QTR 1	QTR 2	QTR 3	QTR 4
2 qtr delay vs. correct	D+	S	S	S
1 qtr delay vs. correct	D-	S	D-	D-

Fig. A5 shows that Batch Size is mostly unaffected by a delay. A sensitivity Analysis makes the point clear. It can be seen from the ranges, that the values are almost similar after period one for a 2-quarters delay, but are different for a 1-quarter delay. This implies that the average values of the information due to 1-quarter delay and 2-quarters delay are the averages of the same range of values, indicating that there is no affect of time delay.

Fig.A6 – Batch Size;
Dataset Wrong half / Baseline policy (for profit)
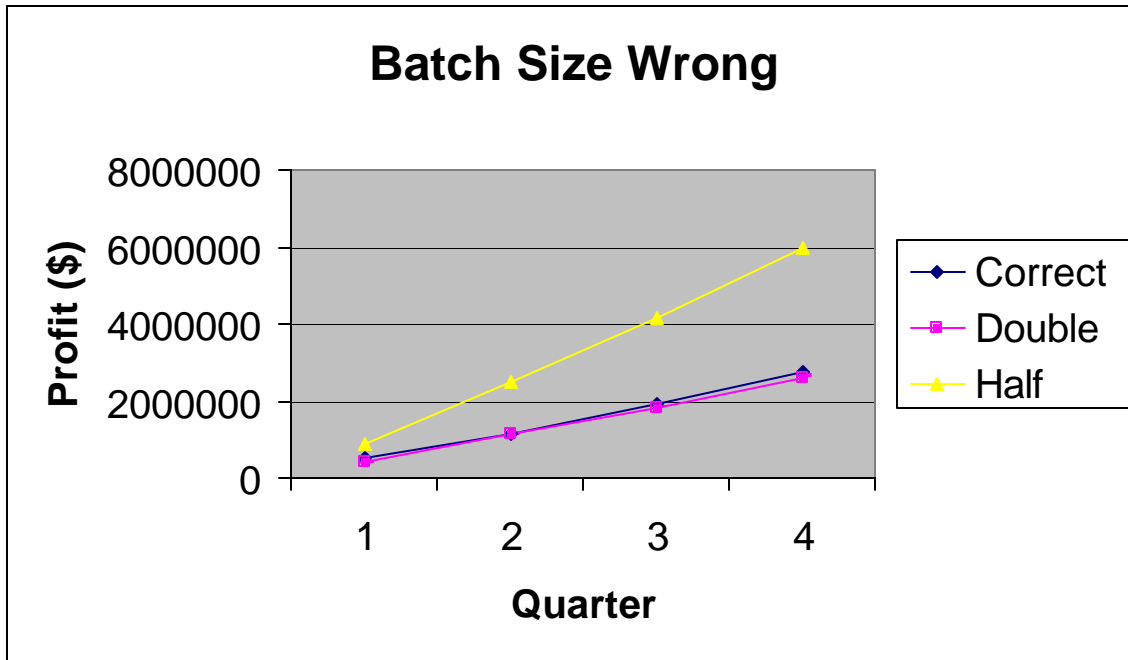*Dataset Wrong double / Baseline policy (for profit)*

Table A6

	QTR 1	QTR 2	QTR 3	QTR 4
Double vs. correct	S	S	S	S
Half vs. correct	D+	D+	D+	D+

It can be noted that a large increase in Batch Size has no affect on profit, but a small decrease will change profits drastically. A range analysis shows that the correct and double values coincide.

Fig.A7 – Order Level;
Dataset delayed 1 quarter / Baseline policy (for profit)
Dataset delayed 2 quarters / Baseline policy (for profit)

Table A7

	QTR 1	QTR 2	QTR 3	QTR 4
2 qtr delay vs. correct	D+	S	D-	D-
1 qtr delay vs. correct	D-	S	S	S

A 2 quarters delay on Order Level has an impact on the functioning of the company and lowers the Profit in the long run.
In average, a 1 quarter delay on Order Level doesn't affect the Profit of the company. However, it can be seen from the ranges analysis that the variability in the Profit of the company is much higher with 1 quarter delay scenarios than with correct information. So, effects of a 1 quarter delay are quite unpredictable, and thus they are dangerous.

Fig.A8 – Order Level;
Dataset Wrong half / Baseline policy (for profit)
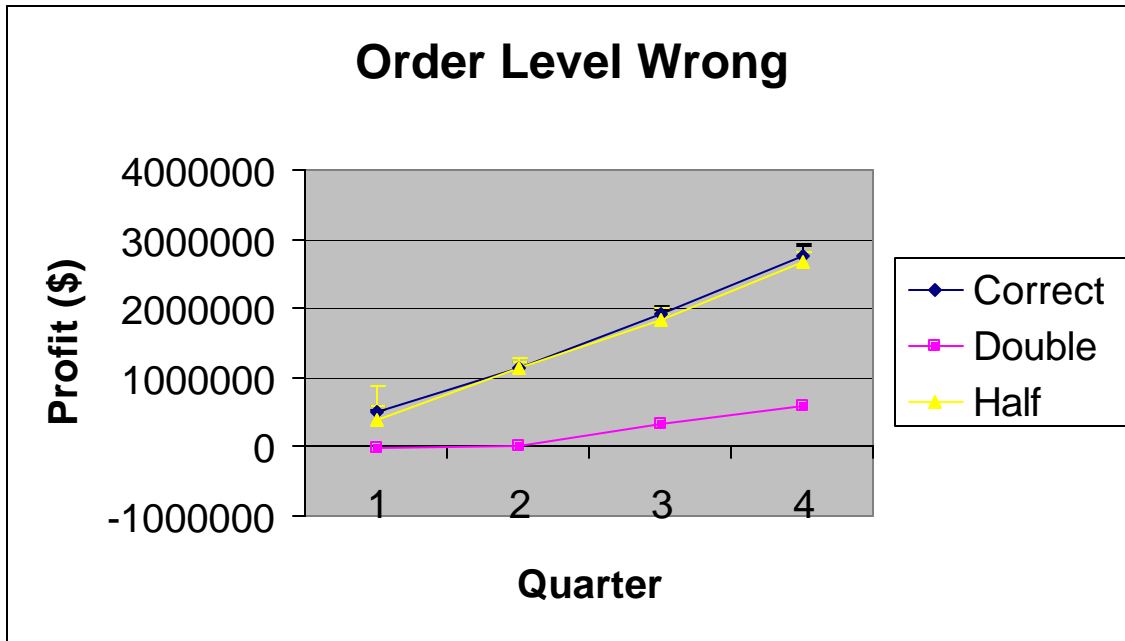*Dataset Wrong double / Baseline policy (for profit)*

Order Level Wrong

Table A8

	QTR 1	QTR 2	QTR 3	QTR 4
Double vs. correct	D-	D-	D-	D-
Half vs. correct	S	S	S	S

When the order level is doubled, there is a decrease in profit but halving the value of correct information has no significant effect, this may be seen from the range analysis also. The range analysis shows that the ranges of the average values are the same, hence the averages truly overlap.

PART B

School of Industrial Engineering
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PRISM Lab
CERIAS Project

To whom it may concern:

We are writing to you with regards to a project undertaken by our research team and funded by CERIAS. The objective of our project is to improve information assurance with a focus on enterprise information systems.

In today's inter-networked companies, the integration of the business operations has created new needs regarding the administration of distributed information systems. Information security is no longer sufficient. The information exchanged must be both secure and significant. At the same time, employees have difficulties to operate with these increasingly complex information systems, and look upon security practices as slowing them down in performing their jobs.

The aim of our research project is to address the above concerns by designing autonomous agents and active protocols to help companies in automatically assuring their information. We define information assurance as the combination of:

- *Information security*, which means protecting information from malicious threats and damage due to external or internal sources.
- *Information integrity*, which should be understood as permanency of the information during communications and storage.
- *Information significance*, which refers to the value that the intended user can get out of the information when s/he receives it.

To help this effort, it is necessary to first identify information assurance requirements for ERP and related information systems, the parameters that could significantly affect information assurance, and the potential threats of assurance failure on the performance and profits of a company.

Surveys have been developed for the departmental and the information system managers' viewpoints, to understand how inter-networked companies use their ERP and related information systems, what their current policies are regarding information management, and what their security and assurance problems may be. We believe that your company can benefit from looking into these issues.

We would highly appreciate it, if you could help us perform this study more efficiently by filling in the attached survey questionnaires. We have included two surveys, one to be filled by the information systems manager and the other to be filled by the various department managers of your company. We would be very grateful if you could forward them, copies of the same. Example answers have been included in order to clarify questions and terminology, but please feel free to contact us via email if you have any questions. You may send the responses to the surveys either by email or by post, by the end of April. When the survey analysis is complete, we will gladly share the results with you.

Thank you very much for your cooperation,

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INFORMATION SYSTEM MANAGER SURVEY (filled sample)

Please review the following questions and answer briefly. Our project team is trying to establish what information assurance is actually required.

Assuring information means having a secure system and procedures, which guarantee that information is secure, and the information keeps its integrity and significance during its lifetime.

Company: Name   **Respondent Name**:   _____
Position: e.g., Information Analyst

1) Are the executive board and senior management aware of the importance of information assurance for the smooth functioning of the company?

- ❑ <u>Yes</u>
- ❑ No

2) If yes, does your company have specific policies and procedures to assure your information?

- ❑ Yes
- ❑ <u>No</u>

3) Which of the following preventive measures does your company employ to protect itself from external threats?

- ❑ <u>Antivirus</u>
- ❑ Hacking watch
- ❑ <u>Firewalls</u>
- ❑ <u>Encryption</u>
- ❑ <u>System authorizations</u> (passwords, access restrictions)
- ❑ Other

4) Does your company distinguish between different datasets in its information system?

- ❑ <u>Yes</u>
- ❑ No

5) If yes, please fill in Table 1 to describe some of the typical datasets and their characteristics.

[See Table 1]

6) Does your company distinguish between different groups of users allowed to log into its information system?

❑ Yes
❑ No

7) If yes, please fill in Table 2 to describe the different groups and their characteristics.
[See Table 2]

8) Does your company have a general data maintenance policy?

❑ Yes
❑ No

9) How often do you have a maintenance session for the data?

e.g., Once every quarter

10) What data do you monitor regularly?

e.g., The number of times an employee logs on to a certain 'locked' piece of information

11) How can your company handle the following problems? (Several answers are possible)

Category	You Can detect	You Can prevent	You Can recover from
Transmission failures			
Data decay during storage			
Accidental loss of data			
Low quality of communication links			
System crash			
Loss of data due to system crash			
Short term delays (one day)			
Long term delays			
Very long term delays			

12) What do you estimate is the damage from non-assured information on your departments' performance? Please circle the appropriate answer.

Relatively insignificant   Somewhat significant   Very significant   None

TABLE 1 (for question 5)
Please fill for 5-6 typical datasets

Dataset name	Data in the Dataset	Assurance features
e.g., Purchasing group	e.g., a) No. of purchased parts available in the data base b) Units consumed in current month c) Units consumed last month	e.g., a) Can only be read and modified by employees of the purchasing department b) Are updated once a day c) Arrive encrypted from suppliers

TABLE 2 (for question 7)
Please fill in for 5-6 typical datasets

Group name	Users in the group	Assurance features
e.g., Project Alpha	e.g., a) All the employees working on project alpha b) The clients of project alpha	e.g., a) Can read all the information concerning project alpha b) Only the manager of the project can modify the data of project alpha c) Modification are done once a week

Thank you very much for participating in our survey!

DEPARTMENT MANAGER SURVEY (filled sample)

Please review the following questions and answer briefly. Our project team is trying to establish what information assurance is actually required.

Company: Name   **Respondent Name(s):** _____

Department: e.g., Production Planning

Position: e.g., Department Manager

1) How often does your department change its strategies in using the company's ERP and related information systems? (e.g., Strategies may include planning and operational procedures, decision policies, decision logic etc)

- ❑ At regular intervals (Please specify the length of the interval): e.g., every month
- ❑ If needed (Please describe what the circumstances are): e.g., change of managing committee

2) At the time of changing your strategies, have you ever had to make your decisions with missing or wrong information? Please circle the appropriate answer.

- ❑   Yes   : often   occasionally
- ❑   No

3) If yes, which information was missing or wrong? [You may refer to your most recent project.]

  e.g., The size of production batch was conveyed incorrectly

4) Which division of the company should have given you this information?

  e.g., Production

5) Could you have waited longer to get this information before making changes in your strategies? If yes, how long? [You may refer to your most recent project.] Please circle the appropriate answer.

- ❑   Yes   : a few hours   a few days   a week or more   other (please mention)
- ❑   No

6) What do you estimate is the damage from non-assured information on your departments' performance? Please circle the appropriate answer.

Relatively insignificant   Somewhat significant   Very significant   None

7) How often do you examine the relative significance (value) of the information you gather/ store/maintain? Please circle the appropriate answer.

Frequently   <u>Occasionally</u>   Only at system change   Not for a long time

8) Why were you not completely informed at the time of making decisions to change your strategies? [You may fill in more than one column, referring to your cumulative experience.]

❑ Sometimes the <u>information was not available.</u>	❑ <u>Sometimes the information was delayed.</u>	❑ <u>Sometimes the information was disregarded.</u>
e.g., ❑ Nobody measures that information. ❑ You are not allowed to get this information.	e.g., ❑ <u>The people were late.</u> ❑ <u>Communication problems occurred.</u>	e.g., ❑ <u>The source was not reliable.</u> ❑ <u>The value was unreasonable.</u> ❑ <u>The information was not complete.</u> ❑ <u>The format of the information was inappropriate.</u> ❑ The information was not accurate enough. ❑ The information was not relevant.

9) Which type of data is most often affected by information failures like delayed or wrong information?

      <u>e.g., Work in Progress, Level of stocks</u>

10) For which type of data are the consequences of information failure the most dangerous?

        e.g., Idle Labor and Resources, Selling prices

11) Which performance measure of your company is most affected when an information failure occurs?

        e.g., Customer relations, Profits

12) Other comments about recurrent problems you encounter while using the ERP and related information systems of the company:

        e.g., This has become a vicious cycle and our department is forced to take decisions without correct information

Thank you very much for participating in our survey!

Information System Manager Survey Analysis

a: Software Company (Korea)
b: Mechanical Construction (France)
c: Software Company (U.S)
d: Government laboratory (U.S)
e: Software Company (U.S)
f: Software Company (Global)
g: Software Company (U.K)
h: Manufacturing Company (Hungary)
I: Bank (France)
J: IT Company (U.S)

Q1. Are the executive board and senior management aware of the importance of information assurance for the smooth functioning of the company?

a) Yes
b) Yes, recent development
c) Yes
d) Yes
e) Yes
f) Yes
g) Yes
h) No
i) Not all
j) Yes

Conclusion: The concept of information assurance is popular.

Q2. If yes, does your company have specific policies and procedures to assure your information?

a) Yes
b) Yes, not much though
c) Yes
d) Yes
e) Yes
f) Yes
g) Yes
h) No
i) No
j) Yes

Conclusion: Yes

Q3. Which of the following preventive measures does your company employ to protect itself from external threats?

a) Antivirus and System Authorization
b) All
c) All
d) All
e) All
f) Antivirus, Firewalls, Encryption, System Authorization.
g) Antivirus, Firewalls, Encryption, System Authorization
h) Antivirus, System Authorizations
i) Antivirus, Firewalls, System authorizations, Filter of attached file in mails
j) Antivirus, Firewalls, System autorizations

Conclusion: Most of the companies have all the preventive measures listed. Antivirus and System Authorizations are the most popular ones.

Q4. Does your company distinguish between different datasets in its information system?
a) Yes
b) Yes, but each dataset is managed differently.
c) Yes
d) Yes
e) No
f) Yes
g) Yes
h) Yes
i) Yes
j) Yes

Conclusion: Yes

Q5. Some typical datasets and their characteristics.

a) Has well-defined assurance features. Data from a certain dataset can be read and modified by employees of that department. The data from the dataset is also updated frequently, ranging from once a day to all the time.
b) NOT ANSWERED
c) The data from datasets can be read and modified by members of the team
d) Guidelines are set by project and network managers
e) NOT ANSWERED
f) Has a standard setup of audit measures for separation of duties and also have their security aligned with this effort. They have specific tools to help audit each dataset.
g) Daily Backup, Developer/Purchaser/Team/Team leader only access and no detection rights depending upon the type of dataset. On completion data is stored in source control
h) Can only be read by the managers
i) Mostly passwords are the assurance features
j) Only certain employees and transaction can access and change data

Conclusion: Most of the companies allow project members to access all the data for their respective projects and audits are conducted on a timely basis.

Q6. Does your company distinguish between different groups of users allowed to log into its information system?

a) Yes
b) Yes
c) Yes
d) Yes
e) Yes
f) Yes
g) Yes
h) Yes
i) Yes
j) Yes

Conclusion: Yes

Q7. The different users groups and their characteristics.

a) Groups are on the basis of project teams and team members can read all the information regarding their specific project
b) NOT ANSWERED
c) NOT ANSWERED
d) Groups are project based and the users are those people who have a 'need to know' about the project. Project and network managers set controls.
e) The members of a project team have access to all the information. Typically they have several levels of access including
   - Read Only
   - Create/Change but no delete
   - Full Access

f) Has a standard setup of audit measures for separation of duties and also have their security aligned with this effort. They have specific tools to help audit each dataset
g) Daily backup and access is given to only those involved with the data/team
h) Only managers can modify data of the production plan. Modification takes place once a week. Modification requires the CEO's permission.
i) It depends on the type of data. But most of the assurance features are passwords
j) Authorizations, training and reporting to review and summarize the processes performed

Conclusion: All project members can read the data, and depending on the project managers and network controls, the have added access and power. Back ups are also a popular practice.

Q8. Does your company have a general data maintenance policy?

a) Yes
b) NOT ANSWERED
c) No
d) No
e) Yes
f) Yes
g) No
h) Yes
i) Don't know
j) No

Conclusion: Some companies do and some don't. In this case it seems that the companies have a general data maintenance policy.

Q9. How often do you have a maintenance session for the data?

a) Whenever necessary
b) Whenever necessary, usually every 6 months
c) Whenever necessary
d) Every project has it's own policy, some more tight and others lose because of the non criticality of the data
e) Irregular
f) The Data Maintenance Group does maintenance and they maintain customer, material and vendor master data as required. Various departments perform other maintenance functions and they each have specific tasks and responsibilities.
g) NOT ANSWERED
h) Once every half year
i) NOT ANSWERED
j) Validate backups quarterly, continuous updating of master data

Conclusion: Whenever necessary.

Q10. What data do you monitor regularly?

a) Disk usage status for users
b) Completion of batch, availability of servers, number of packages on some packages or databases, number of calls to the hot-line
c) Security related information
d) Depends on the sensitivity of the project; some areas log all data while others don't
e) At present very little, but the policy is being changed and a more active approach will be taken in the near future
f) Right now monitoring is simple, it only tells them who logged in and failed to do so. If a data is updated, it cannot be recorded. But the goal is to try and add additional monitoring devices that assist Internal Audit with controls and manual audit procedures.
g) NOT ANSWERED
h) Data integrity of supply chain modules

i) NOT ANSWERED

j) Typically there are authorizations made to protect the data sets

Conclusion: Depends on the company, but mostly depends on the sensitivity of the project. Some companies do not have such audit procedures and hope to implement one in the near future.

Q11. How can your company handle the following problems?

Category	You Can detect	You Can prevent	You Can recover from
Transmission failures	a) Yes b) Partially c) Yes d) Yes e) Yes f) Yes g) – h) – i) Yes j) Yes	a) – b) No c) – d) – e) Yes f) Yes g) – h) – i) – j) -	a) Yes b) Do it again c) Yes d) Yes e) Yes f) Yes g) – h) – i) Yes j) -
Data decay during storage	a) Yes b) No c) Yes d) Yes e) – f) No g) – h) – i) yes j) -	a) – b) – c) – d) – e) – f) Yes (by tape rotation) g) – h) – i) – j) -	a) Yes b) Try previous storage c) Yes d) Yes e) Yes f) Yes, but some data may be lost g) – h) – i) Yes j) -
Accidental loss of data	a) Yes b) By the consequences c) Yes d) Yes e) – f) No g) – h) – i) Yes j) -	a) – b) – c) – d) Yes e) Yes f) No, except to recover from prior back up g) – h) – i) – j) -	a) Yes b) Try previous storage and log files c) Yes d) Yes e) Yes f) No g) Backup h) – i) Backup j) -

Low quality of communication links	a) Yes b) Yes c) Yes d) Yes e) Yes f) Yes g) – h) – i) Yes j) Yes	a) – b) Preventive Survey c) – d) – e) Yes f) Require a particular speed g) – h) – i) Yes j) -	a) Yes b) N/A c) Yes d) Yes e) Yes f) No g) – h) – i) Yes j) -
System crash	a) Yes b) Partially c) Yes d) Yes e) Yes f) Yes g) – h) – i) Yes j) Yes	a) – b) Partial redundancy of servers (clusters) c) – d) Yes e) Yes f) Somewhat with regular PM g) – h) – i) – j) No	a) Yes b) Automatically (with clusters) or by manual repair (more general case) c) Yes d) Yes e) Yes f) Yes , back up systems g) Backup –Hot standby h) – i) Yes j) Yes

Loss of data due to system crash	a) Yes b) By the consequences c) Yes d) Yes e) – f) Yes g) – h) – i) – j) -	a) – b) Partial use of database transactions c) – d) – e) Yes f) Regular backups g) – h) – i) – j) Yes	a) Yes b) Automatically for a part, and with saved storage for the other part. With human watching on the re-start c) Yes d) Yes e) Yes f) Yes, but may have some lost based on incremental backup or mirrored device sync issues g) – h) – i) Recover with back up j) -
Short term delays (one day)	a) Yes b) – c) Yes d) Yes e) Yes f) No g) – h) – i) Yes j) yes	a) – b) – c) – d) – e) Yes f) No g) – h) – i) – j) yes	a) Yes b) – c) Yes d) Yes e) Yes f) No g) – h) – i) yes j) yes
Long term delays	a) Yes b) – c) Yes d) Yes e) Yes f) No g) – h) – i) yes j) yes	a) – b) – c) – d) – e) Yes f) No g) – h) – i) – j) yes	a) Yes b) – c) Yes d) Yes e) Yes f) No g) – h) – i) yes j) yes
Very long term delays	a) Yes b) – c) Yes d) Yes	a) – b) – c) – d) –	a) Yes b) – c) Yes d) Yes

	e) Yes f) No g) – h) – i) yes j) yes	e) Yes f) No g) – h) – i) – j) yes	e) Yes f) No g) – h) – i) yes j) yes

Conclusion:

Category	You Can detect	You Can prevent	You Can recover from
Transmission failures	Yes	No	Yes
Data decay during storage	Yes	No	Yes
Accidental loss of data	Yes	No	Yes
Low quality of communication links	Yes	Depends	Yes
System crash	Yes	To a certain extent	Yes
Loss of data due to system crash	Yes	To a certain extent	Yes
Short term delays (one day)	Yes	No	Yes
Long term delays	Yes	No	Yes
Very long term delays	Yes	No	Yes

Q12. What do you estimate is the damage from non-assured information on your departments' performance?

a) Somewhat Significant
b) Very Significant
c) Somewhat Significant
d) Relatively insignificant
e) Somewhat Significant
f) Relatively insignificant
g) Relatively Significant
h) Relatively insignificant
i) Significant
j) Relatively insignificant

Conclusion: Somewhat significant, however some companies estimate the damage from being very significant to relatively insignificant.

Department Manager Survey Analysis

a: Software Company (Korea)
b: Mechanical Construction (France)
c: Software Company (France)
d: Government Laboratory (U.S)
e: Software Company, Software Development(U.S)
f: Manufacturing Company (Israel)
g: Electronic Company, Midwest (U.S)
h: Bank (France)
I: IT company (U.S)

Q1. How often does your department change its strategies in using the company's ERP and related information systems?

a) At regular intervals; Organizational changes.
b) 2 to 3 times a year; for new projects, approximately 5 a year
c) Whenever needed; operational issue, change in business plan, business event, or request by the management team
d) Whenever needed; as when new technology (systems) enters the market
e) Whenever needed; whenever development targets change
f) Every quarter; on the division steering committee
g) If needed. If the processes don't work, it is fixed. A continuous effort is made in trying to improve the system, but little is achieved.
h) Reforcasting every 6 months. Changes are not always very significant. Otherwise when need be like in the case of important deviations in actual results vs. budget.
i) On a smaller scale- weekly, on a larger scale- monthly

Conclusion: 4 out of the 6 companies say that they change their policies as when required. The requirements may be due to new or impending projects/technology and development targets. They may also be due to changes made by the management team w.r.t the operating methods.

Q2. At the time of changing your strategies, have you ever had to make your decisions with missing or wrong information?

a) Yes, occasionally
b) Yes, often
c) No
d) Yes, often
e) Yes, occasionally
f) Yes, often
g) Yes, occasionally
h) Yes, Often
i) Yes, occasionally

Conclusion: Yes, often

Q3. If yes, which information was missing or wrong?

a) The purpose of the hardware purchasing was not communicated correctly
b) Missing some costs (wrong account number)
    Differences between information from accounting and operations about number of hours of work
c) N/A
d) The capabilities of a switching device
e) Technologies/ timescales for development
f) The market fluctuations and the integrative effect of the decisions
g) Even if we get data, which is quite difficult to, we doubt the integrity of the data
h) Unexact margin; analysis of rentability by customer, sales, product could have been unexact.
i) Pricing information

Conclusion: Various answers, depends on the company and department taking the survey.

Q4. Which division of the company should have given you this information?

a) Systems design team
b) Production, Accounting etc.
c) N/A
d) Vendors
e) R & D function of software development
f) Operation
g) Most data has to queried. The IT person must understand and explain the data
h) Internal finance control
i) Business Analyst

Conclusion: Various answers, depends on the company and department taking the survey.

Q5. Could you have waited longer to get this information before making changes in your strategies? If yes, how long?

a) Yes, a few hours
b) No
c) N/A
d) No need. Might as well put it together and see how it operates on our own.
e) Yes, a few days
f) Yes, a week or more
g) Depends on the severity of the problem. Time of waiting can range from hours to a week.
h) Yes; because we are unable to guess
i) Yes, a few days

Conclusion: Most of the companies can wait, but not for very long. If they have to wait for longer, they go ahead and change their strategies.

Q6. What do you estimate is the damage from non-assured information on your departments' performance?

a) Relatively insignificant
b) Very significant
c) Somewhat significant
d) Relatively insignificant
e) Somewhat significant
f) Very significant
g) Ranges from relatively insignificant to very significant
h) Very significant
i) Very significant

Conclusion: 4 out of the 6 companies say it somewhat significant or very significant. However 2 companies say that it is relatively insignificant.

Q7. How often do you examine the relative significance (value) of the information you gather/ store/maintain?

a) Frequently
b) Frequently, and it is a lot of work
c) Occasionally
d) Only at system change
e) Only at system change
f) Not for a long time
g) Occasionally
h) Frequently
i) Frequently

Conclusion: It depends, some companies do it frequently while there are extreme cases too when the company does not examine the relative significance of information for a long time.

Q8. Why were you not completely informed at the time of making decisions to change your strategies?

a) This company feels that
Sometimes the information had to disregarded due to
- Unreliable sources
- Incomplete information
- Inaccurate information

b) This company feels that
They always had the information available.
It is sometimes delayed since people need time to send the information; this is not the main problem though.
Sometimes the information had to be disregarded due to:
- Unreliable sources

- Multiple sources; the units are messed up, hence making the information inappropriate
- Inaccurate information, stocks for example

c) NOT ANSWERED
d) The information was delayed.
e) This company feels that:

Sometimes information was unavailable, as it was not measured.
Sometimes the information had to be disregarded due to:
- Unreliable source
- Inaccurate information

f) This company feels that:
Sometimes the information was not available since nobody measures it.
It was delayed due to communication problems.
And sometimes the information was disregarded since it was not accurate enough.

g) Communication and unavalilibity is always a problem but the more important problem is when the source is not reliable, unreasonable, incomplete data is given, the format is inappropriate and the information is inaccurate.

h) Unavailable information: IT systems not well organized
Data unavailable or missing or false or misunderstood by people in charge of dealing with them.
Delayed information or imprecise information: useful information was not available for the appropriate decision, committee had to wait.

i) All three factors contributed, but most of the problems were with information significance.

Conclusion: Most companies disregard the information due to the fact that they maybe from unreliable sources or the information may be inaccurate. Also communication problems seem to be a major issue for most of them.

Q9. Which type of data is most often affected by information failures like delayed or wrong information?

a) Purchase Order Processing
b) Expenses by projects, levels of stocks
c) Entry of billable hours and expenses
d) Research Projects
e) Target timescales for delivery, resources required for delivery
f) Stocks buffer, work orders dispatch sequence
g) Level of stocks, and WIP
h) Margin; rentability by customers; sales
i) Work in progress and metrics

Conclusion: Various answers, depends on the company and department taking the survey.

Q10. For which type of data are the consequences of information failure the most dangerous?

a) Selling prices
b) Expenses by Projects
c) Idle labor and resources
d) Large purchases
e) Target timescales for delivery
f) Due dates for orders, sell actions, budgeting update
g) Lost Production, additional costs, excessive inventory
h) Data related to products
i) Cost of inventory

Conclusion: Various answers, depends on the company and department taking the survey.

Q11. Which performance measure of your company is most affected when an information failure occurs?

a) Consumer relations, Profits
b) Profits by projects
c) Profits
d) Budgets
e) Project Planning, Tracking
f) Cash flows, customer relations, purchasing dep.
g) Delivery performance
h) Margins
i) Profits and metrics which lead people to make bad decisions because of bad data

Conclusion: Profits and consumer relations

Q12. Other comments about recurrent problems you encounter while using the ERP and related information systems of the company:

a) Problems are diminishing, quickly resolvable or very trivial
b) Dramatic improvement in quality of data-goal!
c) NONE
d) Surveys are not the best way to assess our problems, we want to see an operational solution
e) NONE
f) Problems with our information system:
- Even though we have the ability to react to changing situations, the decisions are not made quick enough
- Each required process change is delayed by a long lead-time for acquiring the necessary information, analyzing it and arguing about its accuracy
- The company is not fully utilizing the power of integrative information
d) Difficult to tell where you are at and difficult to get data and to change processes because of consequential damages due to tight integration.

e) More time is spent on trying to get the data than in analyzing it
f) Need to be more focused on process standardization.

Conclusion: Decision-making is more of a problem rather than the methods to assure data. Also they feel that the whole process of trying to assure data is too time consuming. The goal is to try and achieve improvement in data quality.