

# Extracting High Quality Scenario for Consensus On New Specifications of Equipment

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## Abstract

In this study, analysis has been executed on the scenarios for consensus on new specifications of linear CCD inspection equipment for the surface of Flat Panel Display, which were extracted with the refinement of Double Helix Loop process for Chance Discovery. The aim of this analysis was to confirm that SCENARIO MAP, which refines KeyGraph by attaching macro photography of defects on the undefined names of the defects on its nodes, helps examinees to extract high quality scenarios through group discussion and to find the roles of SCENARIO MAP and Group discussion with its effect. 11 high quality scenarios for future proposal were extracted successfully after 104 scenarios from first text mining process of objective data. Also, we found that SCENARIO MAP played the role to help examinees to identify the undefined defects and interpret the context of objective data and subjective data easily and the group discussion accelerates them to exchange their inherent experiences, know how and knowledge. The human centric process of SCENARIO MAP and group discussion can be regarded to give effect to extract these high quality scenarios.

**Keywords:** KeyGraph, SCENARIO MAP, Double Helix Loop process, Chance Discovery

## 1. Introduction

In this study, the case of the Charged-Couple Device inspection equipment for defects on related films for Liquid Crystal Display (FPD) was chosen because none of new proposals for new specifications have been created to improve the current performance of the equipment, though a group discussion among a manager and technical sales persons has been held frequently based on common text files of customer call report and test report on the server in our company. [1]

The Double Helix Loop process for Chance Discovery [2] is human centric process with data mining tool. And it has been adopted for various business purposes

and extracted scenarios for chance discovery successfully. So, the Double Helix Loop process was adopted for the case.

The analysis is executed for the purpose of the followings.

(1) Confirming application of the refinements of the process to the case can be helpful to extract high quality scenarios

(2) Finding roles of SCENARIO MAP [2], which is made by attaching macro photography of defects on the corresponded names of defects on nodes of KeyGraph [3], and Group Discussion to extract high quality scenarios

## 2. The refinements of Double Helix Loop process

We adopted the Double Helix Loop process for the case first but found that it was neither easy for us to interpret the context of KeyGraph nor to extract scenarios through group discussion. Because, the objective defects on 16 kinds of related films for Liquid Crystal Display are so many and each of them are slightly different in shape and size and are undefined among our sales group. Furthermore, the names of defects were determined between technical sales people and his customer and/or similar names for different defects sometimes were used in the customer call reports and test reports. It is said that Double Helix Loop process takes a long time because both of objective data and subjective data shall be exhibited to people by turn and needs its efficiency for business application. [2] So, we consider modifying the Double Helix Loop process and adopting the following refinements of the process.

(1) Separate all customer reports and test reports into 16 sets of the text data, each of which is written by one sales person for one kind of film.

KeyGraph shall process one set of the text data as an Objective data. Repeat the process 16 times for 16 kinds of films. Scenario extraction through group discussion process per one set of data is called a case.

(2) Make a “SCENARIO MAP” [2] before group discussion, which identify undefined defects in common by attaching macro photography of defects to corresponded names of defect on nodes of KeyGraph.

(3) Skip exhibiting 16 sets of subjective data with KeyGraph each time after group discussion. The scenario creation process with group discussion is executed after exhibiting accumulated 16 sets of subjective data in order to improve the accumulated process time. [4]

(4) Govern the rule that all members in the group must articulate their own opinion and/or proposal per case to prevent inclining, connivance, and silence during group discussion. [5] Scenarios shall be created and discussed till all members can accept them but the extraction of scenarios created per case shall be made by show of hands of all members by the end of set up time per case in order to control total planned process time.

### 3. Experimentation of refinements of Double Helix Loop process

The conditions of the experiments is as follows:

Firstly, we chosen one (1) sales manager(SM), two (2) experienced technical sales person (ETS) and three (3) inexperienced technical sales person (ITS) in total of six (6) people. Secondly, 322 sheets of macro photography for 20 groups 62 kinds of defects were collected for text data of customer call report and test report for 16 kinds of FPD. Finally, the following process flow was adopted.

- (1) Data Pretreatment: Separate one (1) set of customer call report and test report for one (1) kind of films and prepare 16 sets of them individually.
- (2) Data Mining: Output 16 charts of Polaris [6], which is revised tool of KeyGraph, from 16 sets of them.
- (3) SCENARIO MAP: Prepare 16 SCENARIO Maps by attaching macro photography of defects to nodes of these objective names on the chart of Polaris. Macro photography on node of all defects names identify undefined defects in common at the group.
- (4) Exhibition of SCENARIO MAP: Exhibit SCENARIO Maps to all examinee on the screen one by one.
- (5) Group Discussion: Utter individual interpretation of SCENARIO MAP or his own proposal and write the scenarios on white board. Delete, add or amend the scenarios while discussion till the end of set up time.
- (6) Extraction of Scenarios: Select the scenarios by show of hands at the end of set up time and extract the scenarios approved by all of examinee.
- (7) Repeat the process: Repeat the process for 16 SCENARIO Maps.

- (8) Subjective data: Prepare all scenarios of 16 cases by time series
- (9) Data Mining: Output one (1) chart of Polaris from the subjective data.
- (10) SCENARIO MAP: Prepare one (1) SCENARIO Maps by attaching macro photography of defects to nodes of these objective names on the chart of Polaris. Macro photography on node of all defects names identify undefined defects in common at the group.
- (11) Exhibition of SCENARIO MAP: Exhibit the SCENARIO Maps to all examinee on the screen.
- (12) Group Discussion: Utter individual interpretation of SCENARIO MAP or his own proposal and write the scenarios on white board. Delete, add or amend the scenarios while discussion till the end of set up time.
- (13) Extraction of Scenarios: Select the scenarios by show of hands at the end of set up time and extract the scenarios approved by all examinee.

### 4. Analysis of extracted scenarios from the experimentation

We analyzed the classification of scenarios, roles of SCENARIO MAP and evaluation of Usefulness, Recognition, and Consensus of the scenarios and Contribution of the process.

#### 4.1. Analysis of Classifications of extracted scenarios

We executed the experimentation of refinements of Double Helix Loop Process to 16 cases. 104 scenarios were extracted from 16 SCENARIO Maps.

The 104 scenarios are classified to 85 present situations and 19 future proposals. (Ref. Chart 1.) 82 of 104 scenarios contain word of red node of these SCENARIO Maps. (78.8%)

Chart 1:Classification of Scenarios

Experiment	Present situation	Future Proposal	Total
Scenarios form 16 SCENARIOMAPS	85	19	104
Scenarios from 104 Scenarios		11	11

11 future proposals were extracted from new SCENARIO MAP (Ref Fig.1 and Chart 2.), which is made from the time series of these 104 scenarios

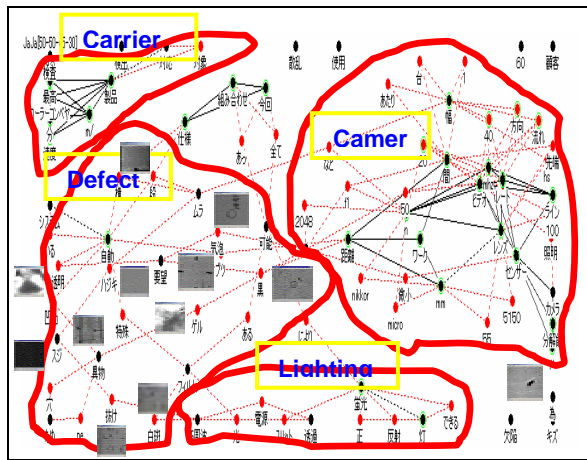


Fig. 1: SCENARIO MAP made from 104 scenarios

Chart 2 Example of 11 Scenarios extracted from 104 scenarios

- Use scattered Fluorescent lumps with high frequency power supply in regular reflection and in transmission at two stages in order to inspect defects such as Chink, Pustule, Black dot, White dapple, Foreign body in general on PET, PS, Special film and coated film.
- Use metal halide lump or halogen lump in regular reflection and in transmission at 2 stages in order to inspect defects such as White dapple, Air bubble, Crenellation
- Use filter software together with lighting conditions in order to inspect defects such as Scratch, Spottiness, Line, in case it is difficult to adjust lighting conditions.
- Develop and propose a sheet feed conveyor with the inspection equipment to our customers in accordance with strong requirement from the market.

## 4.2. Analysis of roles of SCENARIO MAP for extracted scenarios

We analyzed Correlation matrix and Multivariate transformation figure for number of characters of scenarios and that of words of black nodes and red nodes contained in the scenarios per SCENARIO MAP.

Number of characters of 85 present situations has strong correlation 0.800++ with that of words of black nodes contained in these scenarios. (Ref. Chart 3) But the number of characters of 19 future proposals does not have correlation with that of words of black nodes contained in the scenarios. Neither number of characters of 85 present situations nor that of 19 future proposals has correlation with each number of words of red nodes contained in these scenarios.

Chart 3. 85 present situations correlation matrix

Variances	Number of Characters	Number of Black Nodes	Number of Red Nodes
Number of Characters	1.000	0.800++	0.529
Number of Black Nodes	0.800++	1.000	0.293
Number of Red Nodes	0.529	0.293	1.000

The analysis of time series variance among number of characters of scenarios and numbers of words of black nodes and red nodes contained in these scenarios, which were extracted from each SCENARIO Maps, was executed.

We observed the following common features in all of 10 SCENARIO Maps, which extracted 19 future proposals. (100%)

1. The number of characters of the present situations decreases just before extracting a future proposal.
2. The number of words of red nodes, which are contained in the present situations, decreases just before extracting a future proposal.

In addition to these features, we observed a following feature in 8 SCENARIO Maps out of 10, which extracted 19 future proposals. (80%)

3. The number of words of red nodes, which are contained in the present situations, increases just after extracting a future proposal.

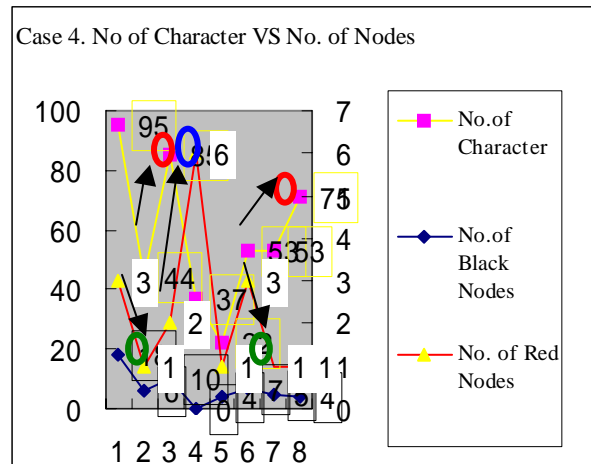


Fig.2: Number of Character and Black & Red nodes in scenarios

## 4.3. Analysis of evaluation of extracted scenarios

We analyzed the evaluation of 104 scenarios extracted from 16 SCENARIO Maps, which are composed from

85 present situations and 19 future proposals, and 11 future proposals extracted from SCENARIO MAP which is made from 104 scenarios. The evaluation was executed by all examinee in the view of Usefulness, Recognition, Consensus and Contribution.

We use Statistic (Mean Value (Mean), Standard Deviation (SD) as analysis method and observed the following features.

(1) Usefulness: SM marked the lowest points 4.7 points to 85 present scenarios but the highest points 7.2 points to 19 and 11 future proposals. The average point for present situations was marked low 5.4 points but high 7.0 points for 19 future proposals and 6.8 points for 11 future proposals.

(2) Recognition: ETS marked the highest point between 8.8 and 9.3 points for 85 present situations, 19 and 11 future proposals. But ITS marked the lowest point between 5.2 and 5.9 points for them.

(3) Consensus: All examinee marked higher point between 8.7 and 8.9 points for 85 present situations, 19 and 11 future proposals.

(4) Contribution: SM marked the highest point 5.2 points for 85 present situations, 6.9 points for 19 future proposals and 8.1 points for 11 future proposals. The average point of all examinee increases 4.3 points for 85 present situations and 5.3 points for 11 future proposals

In addition, we compared the statistic data of 19 future proposals with that of 11 future proposals.

(1) Usefulness: ETS evaluated 11 future proposals lower than 19 future proposals. All of standard deviation for 11 future proposals is equal or lower than that of 19 future proposals except ETS-2.

(2) Recognition: All of standard deviation data for 11 future proposals are lower than that of 19 future proposals.

(3) Consensus: All of standard deviation data for 11 future proposals are lower than that of 19 future proposals except ETS- 2.

(4) Contribution: All of average points for 11 future proposals are higher than that of 19 future proposals. All of standard deviation data for 11 future proposals are lower than that of 19 future proposals.

## 5. Conclusion

The undefined names of defects are mainly shown on red nodes of Polaris and cause the difficulty of interpretation of Polaris. SCENARIO MAP helps all examinees to identify the defects names with macro photography in common and to interpret the context of it easily.

We conclude that the black nodes refer examinees to most of topics of SCENARIO MAP and help them to extract 85 present situations because the number of

characters of 85 present situations has strong correlation 0.800++ with that of words of black nodes contained in these scenarios.

On the other hand, the red nodes play the different important roles, though the number of characteristics of 85 present situations does not have correlation with that of words of red nodes contained in these scenarios. We infer that examinees first pay attention to defects and move their attention to another island which is composed of black nodes with links and shows another topic. They refer to bridge, which is red nodes between islands, and interpret the topic of another island from the relation with defects roughly. So, the number of characters of first scenario for present situations, which described the topic on another island, is low. Then, they start interpret the topic deeply referring to black nodes and red nodes which link to island isolate. So, the number of characters of the scenarios for present situations turns to be increased with that of words of red nodes once after interpreting the topic of another island deeply.

We conclude that examinees repeat the above process and fully interpret the context of SCENARIO MAP and extract scenarios for present situation and future proposal.

## 6. References (This is “Header 1” style)

- [1] Evans, J., “Bias in Human Reasoning Caused and Consequences”, Hillsdale (1987)
- [2] Ohsawa, Y.,” Modeling the Process of Chance Discovery”, Ohsawa and McBurney .P., Eds, *Chance Discovery*; Springer Verlag pp.2-15. (2003)
- [3] Ohsawa, Y., Benson E. N., and Yachida, M., “KeyGraph Automatic Indexing by Co-occurrence Graph based on Building Construction Metaphor”, Proc Advanced Digital Library Conference (IEEE ADL’98), pp/2. -18. (1998)
- [4] Brooks, R.A.,”A Robust Layered Control Systems for a Mobile Robot”, IEEE Transaction on Robotics and Automation 2, No.1, pp.14. -23. (1986)
- [5] Festinger, L., “A theory of cognitive dissonance, Evanston, IL. Row, Peterson”, (1957)
- [6] Okazaki, N. and Ohsawa, Y., “Polaris; An Integrated Data Miner for Chance Discovery”, In proceedings of The Third International Workshop on Chance Discovery and Its Management, Crete, Greece (2003)