

What Model(s) of Assurance Cases Will Increase the Feasibility of Accomplishing Both Vision and Strategy?

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ABSTRACT

The purpose of this study is to identify successful model(s) that improve the feasibility of accomplishing management vision and management strategy. To that end, this study compared a total of eight models which were described in an assurance case of ISO15026-2-2011: four models (Management vision model, Management strategy model, Business process model, and IT system model) were examined twice, assuming both before and after an organization's management strategy was implemented. Based on the comparison results, the models that were important for feasible implementation of management strategy, as well as the most effective timing of evaluating assurance cases, were identified. We collected data from two evaluation methods of a structured questionnaire and multiple open questions. The respondents were Japanese employees working for various companies in Japan. After describing each model and the evaluation method used in this study, we show the evaluation results, and conclude with future research directions.

Keywords: Assurance Case, Gap Analysis, Open Coding, Storyline.

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1. INTRODUCTION

Improving the feasibility of accomplishing management vision and management strategy is important for organizations. Kobayashi et al. (2017) proposed a method enabling stakeholders to confirm and evaluate the management strategy by using an assurance case of ISO15026-2-2011. Their study however did not show to what extent

the Management vision model, Management strategy model, Business process model, and IT system model respectively contribute to improving the feasibility of accomplishing management vision and management strategy.

Filling this gap of knowledge, the purpose of this study is to identify successful model(s) that improve the feasibility of accomplishing both management vision and management strategy. A total of eight models are used in this study. Four models are examined twice, once before and one after the assumed implementation of an organization's management strategy.

Specifically, our results identified the model(s) which are important for feasible implementation of management strategy, as well as the most effective timing of evaluating assurance cases. We conducted and collected data using two evaluation methods: a structured questionnaire and multiple open questions. 67 participants responded from several companies in Japan. The first author of this paper presented the participants an assurance case that included four different models. Each participant answered the questionnaire and wrote responses to the open questions.

We analyzed and compared gathered data among a total of eight models. Section 2 summarizes previous studies. Section 3 describes each model, and the evaluation method used in this study. Section 4 shows and discusses the evaluation results using the method described in Section 3. Section 5 concludes with future research directions.

2. PREVIOUS STUDIES

2.1. Assurance Case

The genealogy of assurance case began in the discussion of a safety case proposed by Kelly. Kelly (1998) proposed a safety case as a means for performing clear, complete and reasonable discussion. The argument is that using the safety case will help operations to reach an acceptable level of safety among stakeholders. An assurance case (Menon et al., 2009) extends the discussion area to the whole quality of the discussed system including "safety" as proposed in the safety case. An assurance case is mainly an assurance method using six nodes, including Goal, Context, Strategy, Evidence, Monitoring, and Undeveloped. (GSN Community, 2011; Matsuno et al., 2010). These six nodes are shown in Table 1.

Furthermore, Anwar et al. (2016) describes the discussion on internal control, which also requires to make a process and rules with evidences, similarly to assurance cases. Internal control however is described in text format instead of structuralization. Assurance cases focused in this study however differs from internal control in terms of 1) the description method of assured contents, 2) stakeholders making an agreement, and 3) the scope of assurance.

Table 1. Six nodes in assurance cases.

Node	Figure	Explanation
Goal		Goal describes what to assure, with a combination of a subject and predicate.
Strategy		Strategy describes how to break down the Goal into sub-goals leading to the lower layer.
Context		Context describes the state, or environment and conditions of the System, and shows ways to lead to the Goal and Strategy.
Evidence		Evidence eventually assures that we can reach the Goal, and shows ways to lead to the Goal.
Monitoring		Monitoring is intended to represent Evidence available at runtime, corresponding to the target values of in-operation ranges.
Undeveloped		Undeveloped shows the status that there is no Evidence or Monitoring, or discussion supporting the Goal.

2.2 Description Methods of Assurance Cases

There are various description methods with regard to assurance cases. Very briefly, Kaneko (2014) demonstrated models relevant to assurance cases. Since information security is based on a Common Criteria that uses a Logical Model and a Concrete Model, Kobayashi et al. (2016a) proposed a method of creating an assurance case for a business process by using a Logical Model and a Concrete Model. Kobayashi et al. (2017) proposed an assurance case description method connecting the management vision, management strategy and business process, unlike Kaneko (2014) and Kobayashi et al. (2016a), which focused on a specific layer of the hierarchical structure of an assurance case. Kobayashi et al. (2015) proposed an assurance case description method connecting the business process and IT system. The proposed method in this study also connects multiple layers of the hierarchical structure of an assurance case, instead of focusing on one layer.

The novelty of this study thus lies in connecting the management vision, management strategy, business process and IT system described in an assurance case, as well as comparing respective models (Management vision model; Management strategy model; Business process model; and IT system model) both before and after an organization's management strategy was assumingly implemented.

3. FOUR EVALUATED MODELS AND EVALUATION METHODS

On the one hand, Kobayashi et al. (2015, 2016a, 2017) proposes assurance case description methods in the Japanese language because an assurance case is a visualization method using a natural language. On the other hand, in Section 3, we describe the models relevant to this study instead of the description method because this study compares the models that are created with the assurance case description method.

3.1 Models Consisting an Assurance Case

Based on Kobayashi et al. (2015, 2017), the hierarchical structure of an assurance case is depicted in Figure 1. The structure consists of four models. Each model is described hereinafter.

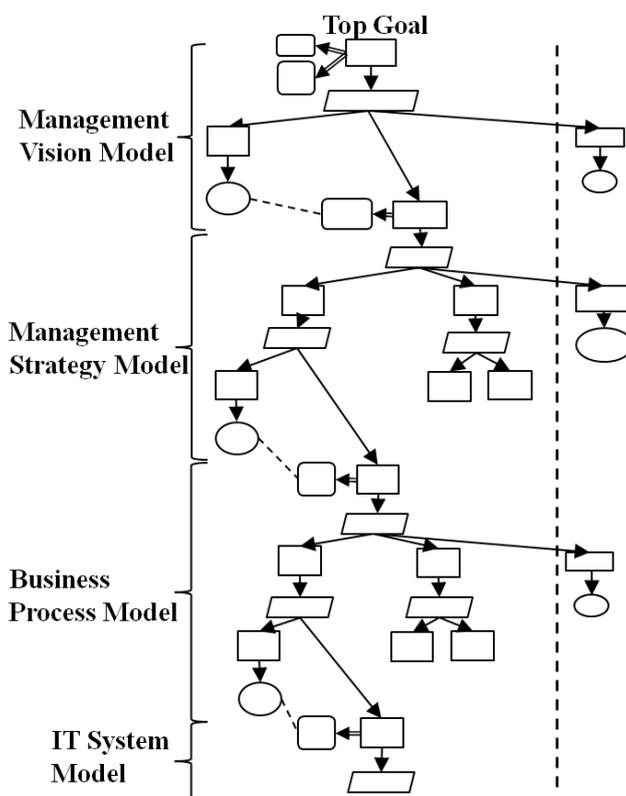


Figure 1. Connection of Models Consisting an Assurance Case, based on Kobayashi et al. (2015, 2017)

<Management vision model>

The Management vision model is a layer of an assurance case, which describes the activities to set numerical targets linking the management vision and the management strategy.

Table 2: Correspondence of “Questionnaire question” and “Criteria of assessed model and timing of evaluation”.

Criteria of assessed model, and timing of evaluation	Questionnaire statement
Management vision before starting management strategy	It is effective for an organization to evaluate the management vision before starting the management strategy, in order to accomplish the management vision and management strategy.
Management vision after ending management strategy	It is effective for an organization to evaluate the management vision after ending the management strategy, in order to accomplish the management vision and management strategy.
Management strategy before starting management strategy	It is effective for an organization to evaluate the management strategy before starting the management strategy, in order to accomplish the management vision and management strategy.
Management strategy after ending management strategy	It is effective for an organization to evaluate the management strategy after ending the management strategy, in order to accomplish the management vision and management strategy.
Business process before starting management strategy	It is effective for an organization to evaluate the business process before starting the management strategy, in order to accomplish the management vision and management strategy.
Business process after ending management strategy	It is effective for an organization to evaluate the business process after ending the management strategy, in order to accomplish the management vision and management strategy.
IT system before starting management strategy	It is effective for an organization to evaluate the IT system before starting the management strategy, in order to accomplish the management vision and management strategy.
IT system after ending management strategy	It is effective for an organization to evaluate the IT system after ending the management strategy, in order to accomplish the management vision and management strategy.

<Management strategy model>

The Management strategy model is a layer of an assurance case, which describes the activities to detail the management strategy based on the numerical targets to accomplish the management vision. This model describes only the management strategy, excluding the business process.

<Business process model>

The Business process model is a layer of an assurance case, which describes concrete activities in the business process to implement the management strategy. As this model details the business process, it clarifies who is in charge of each activity in the business process, and who has assured the business process. Thus, personnel placement and business improvement will be needed in proportion to the workload.

<IT system model>

The IT system model is a layer of an assurance case, which describes the IT system corresponding to the business process. This model defines the business process the IT system supports, and the business process operated manually, which as a result clarifies the range of the IT system.

3.2. Evaluation Methods

3.2.1 Data collection method

This study implemented a questionnaire with Japanese employees working for companies, and assessed whether the four models described in Section 3.1 were effective for improving the feasibility of accomplishing management vision and management strategy. We asked the respondents in the questionnaire to what extent they think each model both before starting and after ending the management strategy was effective for improving the feasibility of accomplishing the management vision and management strategy. We then compared the models, before starting and after ending the management strategy, which were described in an assurance case.

Table 2 shows the questionnaire questions assessing to what extent each model contributes to improving the feasibility of accomplishing management vision and management strategy. An assurance case has a node of Evidence which includes two types: the Evidence node before starting an organization's management strategy, and the Evidence node after ending the management strategy. We used the Evidence node to evaluate assurance cases and identify differences among the cases before and after the organization's management strategy was assumingly implemented.

Responses were given on a seven-point ordinal scale, ranging from 1-“disagree,” to 3-“agree,” with 4 representing “neither agree nor disagree.” Scores from 5 to 7 were

assumed to be valid for improving the feasibility of accomplishing management vision and management strategy. The questionnaire also included free descriptive space so that we could obtain their comments.

3.2.2.Data analysis method

Based on the questionnaire responses, this study assesses to what extent four assurance case-constituent models, which were examined twice in total, once each both before and after the assumed implementation of an organization's management strategy, contribute to improving the feasibility of accomplishing management vision and management strategy.

Free descriptive answers are analyzed by the following procedure, using qualitative coding methods for qualitative data analysis. (Strauss et al., 2008) This method was used to determine if there are any differences among the four models in terms of what extent to which they respectively contribute to improving the feasibility of accomplishing management vision and management strategy. We assume that the differences would emerge from the analysis of the descriptive answers. In other words, if there were no difference among the four models, no difference would result from the descriptive answers. Kobayashi et al. (2016b, 2017) also uses this comparison method. Below are the steps that we took:

Step 1: View the free descriptive answers for the Management vision model, set the viewpoint for Affinity Diagram grouping (Step 2). It was set in this study as "purpose of evaluation for the Management vision model," in order to show for what purpose the Management vision model is useful.

Step 2: Look for, from the aforementioned viewpoint, the descriptions for the Management vision model that seem to be related, and sort them into groups.

Step 3: Write titles for each group that summarize the essence of the group, at a slightly higher level of abstraction (called "Open coding results of the Management vision model" in this study).

Step 4: Compare with "Open coding results of the Management vision model" the free descriptive answers for the Management strategy model.

Step 5: For the Management strategy model, look for, from the aforementioned viewpoint, the descriptions that seem to be related, and sort them into groups under the same title as the Management vision model, or new groups for different descriptions (called "Open coding results of the Management strategy model" in this study).

Step 6: Write titles for the groups newly made for the Management strategy model.

Step 7: Repeat Step 4, Step 5 and Step 6 for the Business process model.

Step 8: Repeat Step 4, Step 5 and Step 6 for the IT system model.

Step 9: Make a table of “Open coding results of the Management vision model,” “Open coding results of the Management strategy model,” “Open coding results of the Business process model” and “Open coding results of the IT system model” to highlight the differences.

Step 10: Create a storyline using open coding-results of respective four models.

This study ensured the validity of the analysis by having one researcher specializing in qualitative research methods and another specializing in assurance cases review the analysis results (Golafshani, 2003).

4. RESULTS AND DISCUSSION

4.1. Results

The profile of the questionnaire respondents is shown in Table 3.

Table 3: Cross-tabulation table of “Year of working experience” and “Position”

Year of working experience	Position		Total
	Manager	Staff	
0-5	1	3	4
6-10	7	9	16
11-20	9	18	27
21-	17	3	20
Total	34	33	67

For evaluating the questionnaire quantitative results, this study used Dunnett's t-test and compared the four models before starting and after ending the assumed implementation of management strategy, which were described in assurance cases. We set “management strategy _BEFORE” as the control in the Dunnett’s t-test because “management strategy _BEFORE” had the highest average value.

Results of Dunnett’s t-test are shown in Table 4. For “IT system_AFTER,” the difference was confirmed to be statistically significant as to the average value, with Table 4 showing $p = 0.04$. For “IT system_BEFORE,” the trend was confirmed to be statistically significant as to the average value, with Table 4 showing $p = 0.12$. We did not assess statistical significance for the others.

We created a storyline, based on Gap Analysis (Langford et al., 2007), to improve the feasibility of accomplishing management vision and management strategy. Gap Analysis is a method for identifying the degree to which current systems satisfy a set

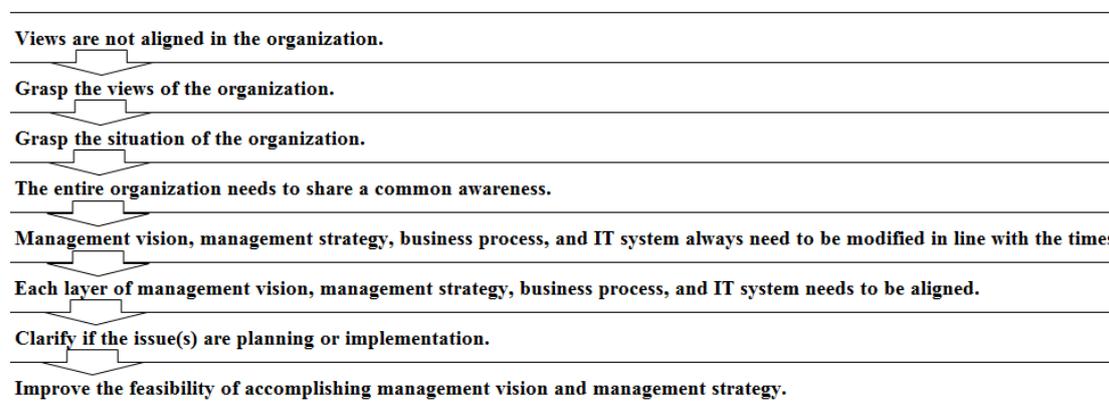
of requirements. The goal of Gap Analysis is to align an anticipated future outcome with a future reality that can be formulated, definitized, and established or constructed (Langford et al., 2007; Yang et al., 2013). By using the framework of Gap Analysis, we categorized the open coding results from the four models into eight stories, which form the storyline as a whole. The open coding results and the created storyline are shown in the Appendix. The created storyline is shown in Table 5.

Table 4. Results of Dunnett’s t-test.

test object	average	p value*
management strategy_BEFORE	5.636	-
management vision_BEFORE	5.318	.788
management vision_AFTER	5.167	.407
management strategy_AFTER	5.500	.997
business process_BEFORE	5.273	.675
business process_AFTER	5.227	.556
IT system_BEFORE	4.985	.117
IT system_AFTER	4.864	.040

BEFORE refers to "before starting of management strategy";
 AFTER refers to "after ending of management strategy".
 *A value from each test object was compared to a value from management strategy BEFORE object.

Table 5. Created storyline



We created a storyline as shown in the following paragraph based on the data analysis results. Since improving the feasibility of accomplishing management vision and management strategy requires understanding what the Gaps are, we first extracted concrete issues from the open coding results and set them as the purpose of evaluation for each model (see “purpose of evaluation for the Management vision model” in Step 1 of Section 3.2.2.). Subsequently, in order to summarize the extracted issues, we demonstrate in the storyline the path to fill the Gaps.

Organizations have a concern that “views are not aligned in the organization.” Thus,

to “grasp the views of the organization” is necessary. When organizations are able to grasp the views of the organization, they are also able to present the views of the organization. Accordingly, they are able to “grasp the situation of the organization” based on the views of the organization. When they are able to grasp the situation of the organization, they are able to share a common awareness in the organization, which means “the entire organization needs to share a common awareness.” Based on this common awareness, organizations are able to change in line with the times the management vision, management strategy, business process, and IT system into what they are supposed to be, which means “management vision, management strategy, business process, and IT system always need to be modified in line with the times.” Organizations need to confirm if the respective layer of envisaged management vision, management strategy, business process, and IT system, namely what they are supposed to be, are aligned, which means “each layer of management vision, management strategy, business process, and IT system needs to be aligned.” When organizations are able to confirm if the respective layer of envisaged management vision, management strategy, business process, and IT system are aligned, they can implement them in order to accomplish what they are supposed to be. As a result, organizations are able to “clarify if the issues(s) are planning or implementation” for accomplishing what the management vision, management strategy, business process, and IT system are supposed to be. Repeating this process is likely to “improve the feasibility of accomplishing management vision and management strategy.” Where the issue(s) for the organizations are in the storyline varies depending on the organization which is aiming to improve the feasibility of accomplishing the management vision and management strategy. Thus, when organizations are aware of where their issue(s) are in the storyline, they are able to consider how to solve the issue(s).

Table i and Table ii in the Appendix show the number of responses to the open coding results. Table 6 shows the number of responses to each story, which are discussed in Section 4.2.

4.2. Discussion

The values of Dunnett’s t-test results exceeded the average values. Thus, all the four models are likely to contribute to improving the feasibility of accomplishing management vision and management strategy. The importance of the IT system model for improving the feasibility of management vision and management strategy, however, is lower than the other models, with the trend confirmed to be statistically significant as to the p value for “before starting management strategy.” The importance of the other models is likely to be the same.

Table 6 Story and number of responses

Story	management vision		management strategy		business process		IT system	
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER
Views are not aligned in the organization.	4				6	5	8	2
Grasp the views of the organization	13	14	5	4	7	3	9	3
Grasp the situation of the organization	29	71	27	68	34	48	30	68
The entire organization needs to share a common awareness.	13	13	10	8	4	2	2	1
Management vision, management strategy, business process, and IT system always need to be modified in line with the times.	10	35	6	38	4	42		51
Each layer of management vision, management strategy, business process, and IT system needs to be aligned.	46	3	36	4	30	11	46	16
Clarify if the issue(s) are planning or implementation	53	9	27	15	11	4	15	5
Improve the feasibility of accomplishing management vision and management strategy	4	6	1	5	3	1		2

We first discuss the evaluation results of each story in relation to each model. For “Views are not aligned in the organization,” the numbers of responses respectively for the Business process model and the IT system model were more than twice as great as that for the Management vision model. The results suggest that the employees are aware of this Gap as to the abstract layers of the hierarchical structure of an assurance case, including the Business process model and the IT system model.

For “Grasp the views of the organization,” the number of responses for the Management vision model was more than twice as great as those for the other models. The results suggest that the employees are aware of this Gap as to all the models both before and after the assumed implementation of an organization’s management strategy.

For “The entire organization needs to share a common awareness,” the numbers of responses for the Management vision model and the Management strategy model were more than three times as great as that for the Business process model. The results suggest that the employees are aware of this Gap as to the abstract layers of the hierarchical structure of an assurance case, including the Management vision model and the Management strategy model. The Gap is not highly perceived for the Business process model and the IT system model.

For “Improve the feasibility of management vision and management strategy,” the numbers of responses for the Management vision model and the Management strategy model were more than 1.5 times as great as that for the Business process model. The results suggest that the employees are aware of this Gap as to all the four models, and the Management vision and the Management strategy in particular.

Next, we discuss the evaluation results of each model, comparing “before starting management strategy (“BEFORE”)” and “after ending the strategy (“AFTER”).”

For “Grasp the situation of the organization,” the number of responses for AFTER was 1.4-2.5 times as great as that of BEFORE. The results suggest that the employees are aware of this Gap more when evaluating the assurance case after ending the management strategy than evaluating it before starting the strategy.

For “Management vision, management strategy, business process, and IT system always need to be modified in line with the times,” the number of responses for AFTER was three times as great as that of BEFORE. The results suggest that the employees are aware of this Gap more when evaluating the assurance case after ending the management strategy than evaluating it before starting the strategy.

However, as to “Each layer of management vision, management strategy, business process, and IT system needs to be aligned,” the number of responses for BEFORE was over 2.8 times as great as that of AFTER. The results suggest that the employees are aware of this Gap more when evaluating the assurance case before starting management strategy than evaluating it after ending the strategy.

As to “Clarify if the issue(s) are planning or implementation,” the number of responses for BEFORE was 1.8-5.8 times as great as that of AFTER. The results suggest that the employees are aware of this Gap more when evaluating the assurance case before starting management strategy than evaluating it after ending the strategy. Furthermore, the results suggest that the employees are aware of this Gap as to the Management vision model and the Management strategy model, with the number of responses for those models more than twice as great as the numbers for the Business process model and the IT system model.

Based on the discussion above, the results suggest that the employees are aware of the Gap “Improve the feasibility of management vision and management strategy” as to the Management vision model and the Management strategy model. The reason being that the employees tend not to be fully aware of the Gap “Views are not aligned in the organization” and “The entire organization needs to share a common awareness” as to the Business process model and the IT system model; this is an issue that needs to be addressed. This is in line with the Dunnett’s t-test results. It is also likely to be the cause of the statistically significant discrepancy between the IT system model and the Management strategy model. In other words, the Gap “Views are not aligned in the organization” is recognized in the lower abstract layers apart from the Management vision layer. The employees are thus likely to try making the low abstract concept (IT system) consistent with highly abstract concepts (management vision, and management strategy) by aligning in the organization the views for highly abstract concepts.

5. CONCLUSIONS

This study compared the four models of the Management vision model, Management strategy model, Business process model, and IT system model, both before starting and after ending the organization's assumed implementation of management strategy, which were described in an assurance case.

This study showed that Japanese employees working for companies perceived the importance of evaluating the Management strategy model before starting the management strategy, in order to improve the feasibility of accomplishing management vision and management strategy. This study also showed the difference in the average values of the Management strategy model and the IT system model when the organization is aiming to improve the feasibility of accomplishing management vision and management strategy.

The reasons given in the free descriptive answers included "Hard for the employees to align the views in the organization," and "The views of the organization are not grasped." In other words, the employees failed to share a common awareness of the highly abstract concept (management vision, and management strategy). The results thus suggest that ensuring the traceability of the highly abstract concepts and lower abstract concepts by using assurance cases is effective in improving the feasibility of accomplishing highly abstract concepts.

Areas of future research include evaluating management vision and management strategy respectively. To that end, clarifying the boundary between management vision and management strategy is desirable.

APPENDIX

Table i. Created storyline, and open coding results of all the four models

Story	Open Coding Result
Views are not aligned in the organization.	There is a gap between management strategy and IT system. There may be a big gap between management strategy and business process. Business process is not necessarily related to management strategy. It is hard to secure the time for reviewing the business process, and detail the process, when needed. It is hard to change IT system occasionally.
Grasp the views of the organization.	Management vision is made by the leader of an organization. Management vision should not be changed easily. The evaluation period of management strategy is unknown. Evaluation is not feasible. Evaluation can be skipped due to the cost performance. Assess if management strategy is cost-effective. Compare the results with the evaluation conducted before implementing management strategy. Compare the results with the evaluation conducted after implementing management strategy. Evaluating the results of one layer constituting an assurance case is necessary to evaluate those of the other layers.
Grasp the situation of the organization.	Easily assess if the intended results were obtained. Clarify the cause of the results by comparing the evaluation conducted before and after an organization's management strategy was implemented. Identify the strengths and weaknesses of the organization. Grasping the changes in premises such as internal and external environment is necessary. Understand the risks for implementing the respective layer of management vision, management strategy, business process, and information system
The entire organization needs to share a common awareness.	All the members of the organization need to be conscious about whether or not they have headed toward the vision as initially planned. All the members of the organization need to have a common awareness. Clarify the responsibility for implementing the respective layer of management vision, management strategy, business process, and information system. Discussion for the evaluation boosts the organization's heading toward the same purpose.
Management vision, management strategy, business process, and IT system always need to be modified in line with the times.	Modify, as needed, the respective layer of management vision, management strategy, business process, and IT system Change, in line with the times, the respective layer of management vision, management strategy, business process, and IT system. Useful for improvement and integration of the organization. It is important to confirm that management vision, which is positioned on the top of the organization's goal, and management strategy are aligned.
Each layer of management vision, management strategy, business process, and IT system needs to be aligned.	Business process and management strategy need to be aligned. IT system, business process and management strategy need to be aligned Appropriate tactics to support the management strategy are developed. Useful to ensure sufficient measures to implement management strategy. Evaluating the linkage of each layer of management vision, management strategy, business process, and IT system is necessary. Management strategy without logical explanation is not accepted. Useful for assessing if the management vision was appropriately developed, and whether or not it was feasible.
Clarify if the issue(s) are planning or implementation.	Clarify if the issue is the management strategy, or implementation of the strategy. Evaluation before implementing management strategy is crucial before management vision and management strategy are presented. Whether or not the evaluation is useful for improving the feasibility of management strategy is unknown.
Improve the feasibility of accomplishing management vision and management strategy.	Lack of evaluation before implementing management strategy may have the organization deviate from the direction it is supposed to go in. Improve the feasibility of accomplishing management vision and management strategy

Table ii. Open coding results of all the four models, and number of responses

Open Coding Result	management vision		management strategy		business process		IT system	
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER
There is a gap between management strategy and IT system.	2						4	1
There may be a big gap between management strategy and business process.	2				2	3		
Business process is not necessarily related to management strategy.					2	2		
It is hard to secure the time for reviewing the business process, and detail the process, when needed.					2			1
It is hard to change IT system occasionally.							2	1
Management vision is made by the leader of an organization.	2	1		1		1		
Management vision should not be changed easily.	1	2						
The evaluation period of management strategy is unknown.	3	3		1		1	4	1
Evaluation is not feasible.	5	7		3	2	3	2	3
Evaluation can be skipped due to the cost performance.	2	1		1	1	3	1	1
Assess if management strategy is cost-effective.							2	5
Compare the results with the evaluation conducted before implementing management strategy.	7			10		14	1	9
Compare the results with the evaluation conducted after implementing management strategy.	1	13				11		9
Evaluating the results of one layer constituting an assurance case is necessary to evaluate those of the other layers.	2	21		3	14	1	21	25
Easily assess if the intended results were obtained.	2	13		3	12	2	7	21
Clarify the cause of the results by comparing the evaluation conducted before and after an organization's management strategy was implemented.	1	16			8		1	8
Identify the strengths and weaknesses of the organization.	1				1	1	1	
Grasping the changes in premises such as internal and external environment is necessary.	7	8		2	2	9	5	12
Understand the risks for implementing the respective layer of management vision, management strategy, business process, and information system.	8			9	5	7	1	7
All the members of the organization need to be conscious about whether or not they have headed toward the vision as initially planned.	5	5		3	4			
All the members of the organization need to have a common awareness.	6	4		5	2	2		
Clarify the responsibility for implementing the respective layer of management vision, management strategy, business process, and information system.	1				1			
Discussion for the evaluation boosts the organization's heading toward the same purpose.	2	3		2	1	2		2
Modify, as needed, the respective layer of management vision, management strategy, business process, and IT system.	5	23		4	22	2	21	26
Change in line with the times, the respective layer of management vision, management strategy, business process, and IT system.	5	12		2	16	1	21	25
Useful for improvement and integration of the organization.							1	
It is important to confirm that management vision, which is positioned on the top of the organization's goal, and management strategy are aligned.	7	3		12	2	1	2	
Business process and management strategy need to be aligned.	2					12	7	
IT system, business process and management strategy need to be aligned.	2							
Appropriate tactics to support the management strategy are developed.	15			8	1	8	4	15
Useful to ensure sufficient measures to implement management strategy.	1			1				
Evaluating the linkage of each layer of management vision, management strategy, business process, and IT system is necessary.	2			1		2	3	1
Management strategy without logical explanation is not accepted.	17			14	1	7	1	7
Useful for assessing if the management vision was appropriately developed, and whether or not it was feasible.	7	6		2	3			2
Clarify if the issue is the management strategy, or implementation of the strategy.	1			5	9	2	2	1
Evaluation before implementing management strategy is crucial before management vision and management strategy are presented.	4			8	3	2	1	
Whether or not the evaluation is useful for improving the feasibility of management strategy is unknown.				2		3	2	6
Lack of evaluation before implementing management strategy may have the organization deviate from the direction it is supposed to go in.	42	2		10		4	7	
Improve the feasibility of accomplishing management vision and management strategy	4	6		1	5	3	1	2

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REFERENCES

- [1] Anwar,C., Sukoharsono,E.G., Achsin, Subekti, I.(2016), “Empathy Based Allocation As The Role In Controlling Sustainability Operation (A Phenomenological Study At Pondok Pesantren Tebuireng)”, *Review of Integrative Business and Economics Research*, Vol. 5, no. 1, pp.267-295
- [2] Golafshani,N. (2003), “Understanding Reliability and Validity in Qualitative Research, The Qualitative Report Volume 8 Number 4 December 2003”, 597-607, (2003)
- [3] GSN Community. (2011), “GSN COMMUNITY STANDARD VERSION 1”, *Origin Consulting (York)*
- [4] (ISO15026-2-2011), International Organization for Standardization (2011), “Systems and Software engineering Part2: Assurance case”, www.iso.org
- [5] Kelly,T. (1998), “Arguing Safety – A Systematic Approach to Managing Safety Case”, Ph.D. Thesis, University of York
- [6] Kaneko,T. (2014), “CC-Case: An Integrated Method of Security Analysis and Assurance”, Institute of Information Security, Ph.D. Thesis
- [7] Kobayashi,N. Kawase,N. and Shirasaka,S. (2017), “A Proposal of Assurance Case Description Method for Sharing a Company’s Vision”, *Journal of Japan Association for Management Systems*, Vol.34, No.1
- [8] Kobayashi,N., Kawase,M., and Shirasaka,S. (2016a), “A Proposal for an Assurance Case Description Method -Aiming to Tackle Challenges in Work-Related Communication-”, *Journal of Japan Association for Management Systems*, Vol. 33, No.2, 91-107
- [9] Kobayashi,N. and Shirasaka, S. (2015), “A Proposal for an Assurance Case Description Method for Business Assignment Using Information Systems”, *Conference papers of the 55th National Research Conference of Japan Association for Management Systems*, pp.46-49
- [10] Kobayashi,N., Nakamoto,A., Kawase,M., and Shirasaka,S. (2016b), “Comparison of Two Quantitative Evaluation Methods for Assurance Cases”, *International Journal of Japan Association for Management Systems*, Vol. 8 No.1, 27-34
- [11] Langford, G.O., Franck, R., Huynh,T., and Lewis, I.A. (2007), “Gap analysis: Rethinking the conceptual foundations”, Naval Postgraduate School, Monterey, California, Dec 14
- [12] Matsuno,Y., Takamura,H., and Ishikawa,Y. (2010), “A Dependability Case

- Editor with Pattern Library”, *IEEE 12th International Symposium on High Assurance Systems Engineering*, pp. 170-171.
- [13] Menon,C., Hawkins,R., and McDermid, J. (2009), “Defence Standard 00-56 Issue 4: Towards Evidence-Based Safety Standards”, *Proceedings of the Seventeenth Safety-Critical Systems Symposium*, pp. 223-243
- [14] Strauss,A. and Corbin,J. (2008), “Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory, third edition”, London, Sage Publications.
- [15] Yang,K., Ge,B., Zhao,Q., and Jiang, J. (2013), “An architectural approach for capability mapping and gap analysis”, *Journal of Systems Science and Information*, 1(1), pp.86-96