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Case Analysis for the Development of Smart Factory ISP Indicators

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Abstract

The purpose of this study is to create and present a formalized module of ISP (Information Strategy Plan), a smart factory consulting method that is helpful to companies or consultants who will build smart factories. Order of study is First, the theoretical research direction is established through the investigation of related papers. Second, ISP policy research practices are compared to derive practical implementation methods. Third, in order to derive a standardized module method related to the final smart factory ISP, related cases of the government and individuals are compared. As a result of previous research, ISP (Information Strategy Planning), a consulting methodology, is similar to Deming's PDCA, and is regarded as Plan (environment and current status analysis), Do (establishment of future model goals), Check (establishment of implementation plan), and Act (follow-up management). As a result of the study, we obtained the following results. The first step is to analyze the current status and identify the purpose of introduction and problems in plant operation. In the second step, establish a consulting plan and derive a proposal description, strategic task, and master plan. Step 3 establishes detailed action plans, evaluates consulting outputs and consulting, and reports performance. Step 4 is established as follow-up management consulting. The limitation of the study is that although related data were compared to develop the consulting methodology into a standardized module, FGI analysis through experts or Delphi survey were not conducted, so there is a limit to the reliability of the mapping results.

Keywords: Smart Factory, Smart Factory Consulting, Consulting Methodology, Information Strategy Plan, PDCA

1. INTRODUCTION

The purpose of this study is to create and present an Information Strategy Planning(ISP) module, a smart factory consulting methodology necessary for companies or consultants to build smart factories. First of all, consulting was defined as an act of presenting practical solutions to identify and solve various problems in corporate management and helping them be implemented in a timely manner, according to the Small and Medium Business Consulting Industry White Paper(2008). ISP (Information Strategy Planning), a consulting methodology, refers to establishing strategies to effectively achieve an organization's goals, and is the most commonly used methodology so far, starting with James Martin's Strategic Information Planning Methods (1982)[1]. As a common procedure for performing ISPs, Yoo Min-soo(2014) stated that it is conducted in a system of environmental analysis, status analysis (As-Is), future model design (To-Be), and integrated plan establishment[2], Son Seung-hye and Lee Seul(2004) said that it is carried out through the process of analyzing the business direction, analyzing the current state, setting the target state, and establishing an implementation plan[3], Kim Jin-young and Lee Byung-soo(2012) classified the status analysis (AS-IS), target structure development (To-Be), and implementation plan stages on work and informatization in

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internal and external environmental analysis[4]. If I summarize it step by step Environmental analysis in the first stage of ISP's performance identifies the institution's future, management strategy, key success factors, and information technology strategies through environmental analysis, and the analyzed business direction is the basis for business and information technology analysis and presents the direction of the target model. The second-stage status analysis identifies major issues and improvement directions through analysis of the information service performance system, organization, and division of work, and identifies the functional and technical status of related information systems currently developed and operated. The establishment of a three-stage target model is to establish a target model for each improvement task derived to solve pending issues and achieve business goals, and to establish measures to implement the target model and improve the informatization work process. The four-step implementation plan is to define implementation tasks for implementing the target model, identify risks and ROI for each implementation task, select priorities, calculate the required budget, and establish a promotion system for successful implementation. In summary, James Martin's ISP configuration is similar to Deming's PDCA structure[5]. In other words, it can be regarded as Plan (environment, status analysis), Do (future model goal establishment), Check (implementation plan establishment), and Act (post-management). Accordingly, the prior research and the direction of research progress were investigated in connection with the order of PDCA.

2. UNDERSTANDING OF REACH

2.1 The Order and Method of Research

The purpose of this study is to create and present a standardized ISP module, a smart factory consulting methodology. To this end, first, as shown in Table 1, the theoretical research direction is established through the investigation of related papers. Second, the ISP policy research cases were compared to derive practical implementation methods. Third, in order to derive a standardized module method related to the final smart factory ISP, the cases of the government and individuals related to the smart factory ISP were compared.

Table 1. Research Procedure

Procedure	Part 1 Theory-Related Papers	Part 2 Practice-Policy Research	Part 3 Standardization Module Development.
Purpose	Similar research to derive smart factory consulting methods	In order to find a practical ISP, the case of the policy research management system (prism) is analyzed.	Comparison of private and government cases to derive smart factory ISP methods
Research Procedure and Method	1. Prior research on consulting methodology ·Research on consulting methodology 2. Investigation of smart factory consulting methodology ·Smart factory research ·Research on smart factory consulting methodology	1. ISP-related policy research ·Establishment of ISP for non-profit corporation management system by Ministry of Health and Welfare (2016.10.26.) ·ICT-based disaster safety situation management advancement ISP service informatization strategy plan report (2019.06) ·Establishment of Information Strategy Plan (ISP) for the introduction of household chemical products and biocides management system by the Ministry of Environment (2017.05) 2. Other ISP-related research ·Comparison and analysis of methodologies for improving SME information protection consulting (2020.08), Jang Sang-soo ·PMP (Project Management Specialist) methodology	1. Smart Factory ISP Private Case ·Smart factory consulting methodology system (refer to Cha Young-ho) 2. Smart Factory ISP Government Case ·Smart factory application form Small and Medium Business Corporation (2023)
Outputs	Consulting Methodology (ISP) Methodology Summary	How to do a practical ISP	Derivation of smart factory ISP method

2.2 Previous research

In the introduction, James Martin's ISP configuration was similar to Deming's PDCA structure. Accordingly, the prior research and the direction of research progress were investigated in connection with the order of PDCA. We tried to find a theoretical research direction through research on related papers. First, regarding research cases related to SME consulting, Jang Sang-soo(2020) does not apply proven

methodologies such as CIIP, ISMS, and ISO27001 when conducting information protection consulting for each consulting company. Accordingly, the consulting methodology was divided into four stages: environmental analysis, crisis management, countermeasure establishment, and follow-up measures, and a standard information protection consulting methodology was proposed[6]. Second, Yoo Min-soo(2014) developed a status analysis (As-Is, system establishment), future model design (To-Be), integrated plan establishment (domestic application), and a research model that can reflect laboratories in order to derive harmonized standards for bio-safety risk evaluation of infectious disease laboratories using management consulting methodology. Third, in relation to research cases using ISPs, Kim Mi-young et al.(2013) tried to present a plan to establish an information system for rural development projects through the Information Strategy Plan(ISP). It was presented in the first stage of policy trend analysis in rural areas, environmental analysis, second stage work status analysis and demand survey[7], third stage informatization strategy establishment, and fourth stage future model establishment. Fourth, as a PMP study case similar to other strategic plans, Lim Heon-wook(2019) took the certification development process as an example and mapped it to the Project Management Process(PMP), a guide to project management, to derive detailed required knowledge and formalize the process. In other words, it was classified into stage 1 PLAN (environmental analysis, status analysis), stage 2 DO (target model establishment, future model), stage 3 CHECK (implementation plan establishment), and stage 4 ACT (project management)[8]. As a result of investigating previous studies, the consulting methodology was irrelevant even if it was conducted in the order of PDCA.

Table 2. Prior Study of ISP Consulting Methodology

Title	Comparative analysis of methodologies for improving SME information security consulting(2020)	Derivation of Harmonized Standards for Biosafety Risk Assessment of Infectious Disease Laboratories Using Management Consulting Methodology.(2014)	Information System Establishment for Rural Development Projects through Information Strategy Plan (ISP), (2013)	A step-by-step job creation study using PMP in the development process of industrial security managers,(2019)
Necessity	A Case Study on Consulting for Small and Medium Enterprises	A Study on the Methodology of Management Consulting	Research case using ISP	PMP research case similar to strategic plan
Purpose of Research	we propose a standard information security consulting methodology.	. Previous Study on Information Strategy Planning (ISP), a consulting methodology	Proposed ISP for Rural Area Development Project	It map to PMBOK's PMP to derive detailed required knowledge and formalize this process
PLAN Environmental analysis Status analysis	1. Environmental Analysis•Business analysis, definition, analysis	1. Establish a comprehensive framework to incorporate relevant regulations	1. Policy Trend Analysis 2. Business status analysis	1.Project management and business plan development, 9.Contracting plan(2~8 skip)
DO Establishment of target model	2. Crisis management ·Asset identification, analysis and evaluation, selection	2. Designing a model including harmonization criteria	·Informatization strategy establishment ·Establishment of future models	10.Project execution instruction and management,(11~13skip) 14. Request for client response
CHECK Implementation Plan establishment	3. Establish countermeasures ·Establishment, implementation, education and training	3. Review whether it is applicable in Korea		15.Work monitoring, change, control, (16~22 skip) 23.Contract Management
ACT Projec management	4. Follow-up : ·Compliance, Operation,management、Audit and improve	4. A consulting model that analyzes the possibility of reflection		24.End of Project

3. EMPIRICAL RESEARCH

3.1 ISP Policy Study Results Report Case Comparison and Establishment Phase Formulation

In order to derive the formalization of the ISP establishment stage, three results reports were found in the corporate management system at Nara Market, a national comprehensive electronic procurement site, as shown in Table 3. The first is the establishment of an ISP, the second is the advancement of disaster safety

situation management ISP services, and the third is the establishment of an ISP for the introduction of the system, and the consulting methodology standardization was derived after comparing cases. Environmental Analysis and Status Analysis in Phase 1 PLAN Phase 2 DO (Goal Model Establishment, Future Model), Vision and Strategy Establishment, Goal and Strategic Model Count, In the third stage of the CHECK (Implementation Plan Establishment), the master plan, detailed action plan establishment, It was organized into a four-step ACT (project management) plan and a corrective action plan.

Table 3. ISP Policy Study Results Report Case Comparison and Establishment Phase Formulation

N	Ministry of Health and Welfare Establishment of Non-profit Corporate Management System ISP (2016)	ICT-based Disaster and Safety Situation Management Advanced ISP Service Informatization Strategy Plan Report (2019)	The Ministry of Environment established an Informatization Strategy Plan (ISP) to introduce a system for managing living chemicals and biological agents (2017)	ISP Establishment Steps
P	1. Interviews and surveys 2. Analysis of Informatization Status 3. Business status analysis 4. Diagnostic results and issue derivation 5. Benchmarking	1. Policy Trends and Legal and Institutional Analysis 2. Analysis of the current status of Incheon City 3. Analysis of Advanced Construction Cases and Technology Trends 4. Summary of Implications	1. Environmental analysis 2. Status analysis	1. Environmental analysis 2. Status analysis
D	1. Establishing and defining improvement directions 2. Organize target model and establish implementation plan	1. Define strategic tasks 2. Establishment of promotion plan 3. Deriving informationization strategies 4. Defining the target systems	1. Establishing Vision and Strategy 2. Establish a target model 3. a plan to improve the legal system	1. Establishing Vision and Strategy 2. Goals, establishing strategic models
C	1. Establishing an action plan 2. Establishment of resource requirements for each task	1. Defining the Implementation Task 2. Prioritizing Informatization 3. Establishing an Informatization Roadmap 4. Define major task tasks by step	1. Prioritization 2. Calculation of required resources 3. Economic Effects Analysis 4. Analysis by Alternative 5. Establishing an Informatization Master Plan 6. System Operation Organization Plan 7. Change Management Plan	1. Develop detailed action plans (master plan)
A	1. Understand the progress 2. Progress Analysis 3. Establishment of corrective action plan 4. Corrective action	1. Establishment of operating system 2. Preparation of operation plan 3. Preparation of Education and Training Plan 4. Preparation of Manual Management Plan 5. Preparation of countermeasures for technological development		1. Continuous management plan 2. Establishment of corrective action plan

3.2 Standardize the ISP Establishment Stage and Verification of Use as a Smart Factory ISP

Similar cases between the private sector and the government were compared as shown in Table 4. to verify whether the ISP was used as a smart factory ISP[9]. First, it was compared with the smart factory consulting methodology system (refer to Cha Young-ho) and the smart factory application form (Small and Medium Business Promotion Corporation, 2023)[10], Environmental Analysis and Current Status Analysis (PLAN) in Stage 1, Current Status Analysis and Purpose of Introduction, Problems of Factory Operation Development of consulting plans, explanation of proposals, and elicitation of strategic tasks in the second stage of DO (Goal Model Establishment, Future Model) In the third stage of the CHECK (implementation plan establishment), detailed implementation plans, consulting results, consulting evaluation and performance reporting, Stage 4 ACT (Project Management) was organized into consulting follow-up management[11].

Table 4. Comparison of Private and Government Cases for ISP Standardization

N	Standardize	Similar Case	Government projects	Smart Factory ISP Method (Module)	
	Table 3 Policy Research Results Report Analysis Results	Smart Factory Consulting Methodology System	Smart Factory Application Form The Small and Medium Business Corporation		
P	1. Environmental analysis 2. Status analysis	1. Status analysis 2. Establishing a consulting plan and explaining the proposal	1. Purpose of Introduction	1. Status analysis and introduction purpose	1. Environmental analysis
				2. Identifying Problems in Factory Operation	2. Status analysis

D	1. Establishing Vision and Strategy 2. Goals, establishing strategic models 3. a plan to improve the legal system	1. Diagnosis of factory operation, 2. Identification of strategic tasks and establishment of detailed implementation plans 3. Budget	2. Quantitative goals 3. Qualitative goals 4. System Diagram 5. Equipment installation location 6. List of introduced equipment 7. Functional diagram	1. Establishment of consulting plan and description of proposal	1. Establish vision and strategy
				2. Derivation of strategic tasks	2. Establish goals and strategic models
C	1. Establishment of tax exemption plan (master plan)	1. Consulting deliverables 2. Consulting evaluation	8. AS/IS, TO/BE Comparison 9. Project Schedule	1. Establish detailed action plans	1. Establishment of tax exemption plan
				2. Consulting deliverables	·AS/IS, TO/BE comparison
				3. Consulting evaluation	·Verification:
A	1. Sustainability management plan 2. Establish corrective action plan	2. Consulting follow-up management	10. Expected effect	1. Consulting follow-up management	1. Sustainability management plan plans 2. Establish corrective action plan

4. FINAL PROOF

4.1 Application of Smart Factory ISP Module Case

The developed smart factory ISP module was applied as shown in Table 5. As a result of application, it was possible to plan a smart factory consulting strategy for each of the four stages. In other words, it was concluded that the smart factory ISP could be used in the developed method.

Table 5. Smart factory ISP module application cases

N	Smart Factory ISP Module	Smart Factory ISP Module Application Case (virtual)
P	1. Status analysis and introduction purpose	1. Purpose of Introduction : Delivered only simple processed products 2. Solving the Difficulty Process : Reduced defect rate by introducing a 3D precision measurement system
	2. Identifying Problems in Factory Operation	1. Deployment system classification (drawing omitted) : On-site automation and factory operation, ·Product development, ·Supply chain management, ·Corporate resource management
D	1. Establishing a consulting plan and explaining the proposal	1. System Architecture (sample), MES (partial example) ·Reference information management : Common data management ·Sales management : ·Registration of order information ·Receiving and forwarding management : ·Supply materials received
	2. Derive strategic tasks (Master Plan)	1. Quantitative goal (key performance indicator KPI derivation) No 1 | Field P | Key Performance Indicators(KPI) Reduce lead time | Unit Hr | Existing(Former) 48 | Goals(after) 45 | Weight 1 | Remark Automation line criteria 2. Qualitative goals : Securing stable management by establishing a real-time monitoring and monitoring system for manufacturing lines
C	1. Establish detailed action plans	Phase: Requirements Development and execution | Activity: Defining Requirements Design | Task: Collecting requirements, defining Component design, DB design | Supplier input personnel: Advanced (0.5), (M/M) Intermediate (1) (M/M)
	2. Consulting Output	·Sortation : Automate product inspection ·AS-IS : Unable to measure inspection measurement value because of manual processing ·TO-BE : Automatically collect measurements with automatic inspection equipment ·Expectation effectiveness : Management of inspection information by product
	3. Consulting Assessment and Performance Reporting	·Sortation : Reduce labor costs ·Remarks : Reduce additional staffing by leveraging the system
A	1. Consulting follow-up management	

5. CONCLUSION

As a result of previous research, it could be regarded as ISP (Information Strategy Planning) Plan

(environment, current status analysis), Do (future model goal establishment), Check (implementation plan), and Act (follow-up management), which are consulting methodologies. Table 5. As a result of the smart factory ISP module application case, we obtained the following results. The 1st stage plan (environment, current status analysis) is current status analysis and introduction purpose, identification of problems in factory operation, Step 2 Do (establish future model goals) is Establishing a consulting plan and explaining proposals, Deriving strategic tasks (master plan), Step 3 Check (Establishment of implementation plan) is Establishment of specific action plans (propulsion system and schedule plan), Consulting results, Consulting evaluation and performance report, The 4th stage Act (post-management) could be established through post-management consulting. The limitation of the study is that although related data were compared to develop the consulting methodology into a standardized module, FGI analysis through experts or Delphi survey were not conducted, so there is a limit to the reliability of the mapping results.

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