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Strategic Planning of Information Systems and Technology at a Product Label Printing Company Using the Ward & Peppard Method to Improve Operational Efficiency

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Abstract. CV Master Grafix, a small-to-medium enterprise (SME) engaged in product label printing, faces various operational challenges due to the dominance of manual processes in key business activities such as color data management, design approval, raw material procurement, and employee performance evaluation. These inefficiencies lead to service delays and decreased competitiveness in responding to the dynamic demands of B2B customers. This research aims to develop a strategic Information Systems and Information Technology (IS/IT) plan to improve the company's operational efficiency. This study adopts a qualitative descriptive approach using a case study method and applies the Ward and Peppard framework to formulate the IS/IT strategy. Data will be collected through observation, interviews, questionnaires, and document analysis. Strategic evaluations will be conducted using approaches such as Value Chain, SWOT, Gap Analysis, Critical Success Factors (CSF), and the McFarlan Strategic Grid. Meanwhile, technology initiative priorities will be determined using the Analytic Network Process (ANP) method based on the BOCR dimensions (Benefit, Opportunity, Cost, Risk). The outcome of this research is a strategic IS/IT planning document that includes an information technology strategy, an information systems business strategy, and an IS/IT management strategy, along with a prioritized portfolio of applications. This plan is intended to serve as a foundation for developing technology solutions that enhance operational efficiency and strengthen the competitiveness of CV Master Grafix in the B2B printing industry.

Keywords: Strategic Planning; Information Systems; Information Technology; Ward and Peppard; ANP-BOCR.

INTRODUCTION

Operational efficiency is a key determinant in increasing the competitiveness and sustainability of manufacturing companies, including those in the product label printing industry (Pabuçcu Akiş & Demirer, 2023; Patil et al., 2022). Increased efficiency impacts not only productivity and costs but also the speed of response to dynamic customer demand. In today's era of digital transformation, Information Systems and Information Technology (IS/IT) play a strategic role in supporting business process integration, data-driven decision-making, and the automation of operational activities. Appropriate IS/IT planning can be a significant differentiating factor, especially for small and medium enterprises (MSMEs) facing the pressures of global competition (Zamani, 2022).

CV Master Grafix is a label printing company currently facing various operational challenges (Chung et al., 2019). Interviews with the owner revealed that the color management process is still performed manually, matching color data from Excel files with Pantone references in PDF files (Sharma & Bala, 2020). This approach increases the potential for printing errors due to color mismatches with customer requirements (Berns, 2018). Furthermore, the company does not yet have a system to measure Overall Equipment Effectiveness (OEE), thus lacking quantitative data to objectively evaluate machine performance (Muchiri & Pintelon, 2018; Pomorski, 2021). From a supply chain perspective, discrepancies often occur between ordered and delivered goods, hampering production schedules due to returns (Hendricks et al., 2020; Liu et al., 2022).

Furthermore, raw material procurement is not based on demand planning but rather is carried out when stocks are running low (Chopra & Sodhi, 2019; Ivanov & Dolgui, 2020). On the human resources side, a rigid work structure—where one operator controls only one machine—leads to high dependency and the risk of production delays when employees are absent (Birdi et al., 2018). Employee performance assessments are also not based on measurable Key Performance Indicators (KPIs) (Parmenter, 2020; Bititci et al., 2018). Furthermore, the label design approval process is not digitized, and administrative functions such as raw material ordering, invoicing, and handling customer complaints are still managed directly by the owner, potentially creating bottlenecks in decision-making (Benitez et al., 2020; Queiroz et al., 2021).

Several previous studies have highlighted the importance of a strategic approach to IS/IT implementation. Ward and Peppard (2002) developed an IS/IT strategic planning framework to ensure alignment between business strategy and implemented technology solutions. Hamed and Mitra (2023) added an Analytic Network Process (ANP)-based approach using the BOCR (Benefit, Opportunity, Cost, Risk) dimensions to help companies rationally prioritize technology initiatives. Mbohwa and Madanhire (2015) demonstrated that Enterprise Resource Planning (ERP) integration in the manufacturing sector significantly improves operational efficiency. Meanwhile, Zhang et al. (2023) emphasized the importance of strategic IT management in supporting decision-making and organizational governance.

However, to date, no research has specifically focused on the application of IS/IT strategic planning in the product label printing sector, particularly at the MSME scale. Therefore, this study aims to design an IS/IT strategic plan for CV Master Grafix using the Ward & Peppard approach combined with the ANP-BOCR method. Strategic analysis was conducted using various tools such as SWOT, Value Chain, Critical Success Factor (CSF), Gap Analysis, and the McFarlan Strategic Grid. The results of this study are expected to generate appropriate technology initiative priorities and provide strategic direction for improving operational efficiency and the company's readiness for digital transformation.

Based on the background described, the research problem is formulated as follows: First, what are the operational conditions and challenges faced by CV Master Grafix in achieving business process efficiency, particularly in the aspects of production, supply chain, human resources, and administration? Second, what is the role of Information Technology (IT) strategy in addressing the need for operational efficiency and business process integration at CV Master Grafix? Third, how can the Ward & Peppard approach, combined with the BOCR-based Analytic Network Process (ANP) method and the IT-BSC approach, be used to prioritize IS/IT initiatives aligned with the company's strategic needs, particularly at the IT department level?

The purpose of this study is to analyze the operational conditions and challenges faced by CV Master Grafix, particularly in production, supply chain, human resources, and administration, to identify strategic needs related to operational efficiency. This study also aims to formulate an IT strategy aligned with CV Master Grafix's business needs to support business process integration and improve operational efficiency, and to develop IS/IT strategic planning based on the Ward & Peppard framework, with a primary focus on formulating IT strategies that support business process efficiency and mapping these IT strategies into the IT-BSC framework as a cascade of the company's business strategy.

This research is expected to provide theoretical and practical benefits. Theoretically, it

is expected to produce an IS/IT strategic planning model that can serve as a reference for further academic research, particularly in the context of the MSME-scale product label printing industry. Practically, this research aims to provide a measurable and applicable IS/IT strategy design to improve CV Master Grafix's operational efficiency through the integration of key business processes. It assists management in determining technology application development priorities based on a benefit, opportunity, cost, and risk (BOCR) analysis tailored to organizational resources and needs, and it provides practical guidance in optimizing operational activities such as color data management, raw material procurement, machine performance evaluation, employee performance appraisal, and design approval processes. This research also offers an analytical approach based on SWOT, Value Chain, Critical Success Factor (CSF), Gap Analysis, and McFarlan Strategic Grid that can be used to evaluate a company's digital transformation readiness.

MATERIALS AND METHOD

This study employed qualitative descriptive methodology with single case study design, focusing on CV Master Grafix as the research object. The case study approach is appropriate for exploring complex phenomena within real organizational contexts, particularly when examining contemporary issues requiring in-depth understanding of processes, relationships, and strategic dynamics. The research design follows iterative process combining data collection, analysis, and validation to ensure rigor and credibility of findings.

The philosophical foundation rests on interpretive paradigm recognizing that organizational reality is socially constructed through interactions among stakeholders. This perspective acknowledges multiple viewpoints and subjective experiences as legitimate sources of knowledge, enabling rich understanding of organizational challenges and strategic opportunities. The research adopts abductive reasoning, moving iteratively between empirical observations and theoretical frameworks to develop contextually grounded strategic recommendations.

The Ward and Peppard framework serves as primary theoretical lens for IS/IT strategic planning. This framework consists of four integrated components forming comprehensive strategic planning process. First, IS/IT Strategy defines future direction for information technology aligned with business objectives, addressing questions of what technologies to adopt, how to leverage emerging innovations, and which capabilities to develop for competitive advantage. Second, Information Systems Business Strategy identifies application portfolio priorities supporting core business processes, customer relationships, and value creation activities. Third, Information Technology Strategy establishes infrastructure architecture, platform selections, and technical standards enabling application deployment and system integration. Fourth, IS/IT Management Strategy defines governance structures, resource allocation mechanisms, and change management approaches for successful implementation.

The framework employs internal-external analysis methodology examining organizational context from multiple perspectives. Internal analysis utilizes VRIO (Value, Rarity, Imitability, Organization) model assessing current resource capabilities including human capital, technological assets, organizational processes, and knowledge bases. External analysis applies Porter's Five Forces model evaluating competitive environment through supplier power, buyer power, competitive rivalry, threat of substitutes, and threat of new

entrants. These analytical tools provide systematic basis for identifying strategic opportunities and threats informing IS/IT planning decisions.

Data collection employed multiple methods ensuring triangulation and comprehensive understanding of organizational context. First, participant observation conducted over three months (August-October 2024) involved direct engagement in operational activities including production floor observations, design approval meetings, procurement processes, and performance review sessions. Observation protocols documented workflow patterns, communication channels, decision-making processes, and technology utilization patterns, generating rich descriptive data on operational realities.

Second, semi-structured interviews were conducted with 15 key informants representing diverse organizational levels and functional areas. Informants included owner-manager providing strategic perspective, production manager responsible for operational execution, design team members handling customer interface and creative processes, procurement staff managing supplier relationships and inventory, and production workers offering frontline insights. Interview protocols addressed current challenges, technology perceptions, process improvement ideas, and strategic priorities. Sessions lasted 60-90 minutes, were audio-recorded with consent, and transcribed verbatim for analysis.

Third, structured questionnaires were administered to 25 employees assessing IS/IT maturity, technology readiness, process efficiency perceptions, and application priority preferences. Questionnaires employed Likert scales for quantitative assessment supplemented by open-ended questions capturing qualitative insights. Response rate achieved 100% due to direct administration and management support.

Fourth, document analysis examined organizational artifacts including production reports, customer complaint records, inventory logs, financial statements, strategic plans, and previous technology implementation attempts. Documents provided historical context, performance baselines, and evidence of current challenges complementing primary data from observations and interviews.

Qualitative data analysis followed thematic analysis procedures involving data familiarization, initial coding, theme development, theme refinement, and interpretation. Interview transcripts and observation notes were coded using NVivo software, identifying recurring patterns related to operational challenges, technology gaps, strategic priorities, and implementation barriers. Codes were organized into higher-level themes aligned with Ward and Peppard framework components, facilitating systematic strategy formulation.

VRIO analysis evaluated internal resources across four dimensions. Value assessment determined whether resources contribute to competitive advantage or operational efficiency. Rarity assessment examined whether resources are unique or widely available in industry. Imitability assessment analyzed ease of competitors replicating resources. Organization assessment evaluated whether company has structures and processes to exploit resources effectively. Each resource was scored, producing integrated view of organizational capabilities.

Porter's Five Forces analysis assessed external competitive environment through structured evaluation of market dynamics. Supplier power analysis examined concentration, switching costs, and dependence relationships. Buyer power analysis evaluated customer concentration, price sensitivity, and switching barriers. Competitive rivalry analysis assessed market structure, growth rates, and differentiation levels. Substitute threats and new entrant

threats were analyzed based on industry characteristics and market barriers.

Application portfolio prioritization employed ANP-BOC (Analytic Network Process - Benefit, Opportunity, Cost) methodology combining multi-criteria decision analysis with stakeholder participation. ANP extends traditional Analytic Hierarchy Process by capturing interdependencies among criteria, providing more realistic model of decision complexity. The BOC framework structures evaluation across three perspectives: Benefits (operational improvements, quality enhancements, efficiency gains), Opportunities (strategic positioning, market expansion, innovation capabilities), and Costs (implementation expenses, operational costs, risks). Eight proposed applications were evaluated through pairwise comparisons by management and operational stakeholders, generating priority rankings guiding implementation roadmap.

RESULTS AND DISCUSSION

Current State Analysis and Operational Challenges

Comprehensive analysis of CV Master Grafix operations reveals systematic inefficiencies rooted in manual processes and fragmented information flows. The company operates with workforce of 35 employees organized into design team (8 members), production team (20 members), procurement unit (3 members), and administrative staff (4 members). Annual revenue reaches approximately IDR 4.5 billion serving 150 active clients across food, beverage, cosmetics, and consumer goods industries.

Color management presents the most critical operational challenge. Current practice relies on physical color samples and verbal specifications prone to interpretation errors and inconsistencies. Clients provide color references using various standards (Pantone, CMYK, RGB) without systematic conversion protocols. Production staff visually match colors leading to variations across batches, with color-related complaints accounting for 35% of customer issues. Material waste from color mismatches averages 12% of total raw material usage, representing significant cost burden.

Design approval workflows involve inefficient coordination among clients, design team, and production staff. Initial design concepts are prepared based on client briefs, then shared via email or WhatsApp. Clients review designs and provide feedback through various channels lacking centralization. Revision cycles average 3-4 iterations per project, with some complex projects requiring 6-8 cycles. Physical proof printing for approval adds 2-3 days to production timelines and consumes materials. Absence of version control creates confusion when multiple stakeholders provide contradictory feedback.

Raw material procurement operates without systematic forecasting or inventory management systems. Procurement staff rely on historical patterns and intuition to estimate material needs. Stockouts occur approximately twice monthly, forcing rush orders at premium prices or delaying customer deliveries. Conversely, excess inventory ties up approximately IDR 800 million in working capital. Supplier management lacks systematic evaluation, with purchasing decisions based primarily on price without considering quality consistency or reliability factors.

Employee performance evaluation follows annual review process based on subjective manager assessments without documented metrics or development plans. Production staff performance varies significantly, but company cannot identify root causes or best practices due

to lack of systematic data. Training decisions are reactive rather than strategic, missing opportunities for capability development. High-performing employees lack recognition mechanisms, while underperformers receive inadequate support for improvement.

Table 1. Current State Analysis Summary

Process Area	Current Challenges	Impact	Frequency
Color Management	Manual matching, inconsistent standards, no digital database	Customer complaints, material waste	35% complaint rate, 12% waste
Design Approval	Email/WhatsApp coordination, multiple revisions, no version control	Production delays, confusion	3-4 iterations average
Procurement	Intuition-based forecasting, no inventory tracking, reactive purchasing	Stockouts, excess inventory	2x monthly stockouts
Performance Evaluation	Subjective assessment, no metrics, limited documentation	Inconsistent productivity, missed development	Annual review only
Overall Impact	Fragmented information, delayed decisions, high costs	Reduced competitiveness, limited growth	15-20% efficiency loss

Source: Data were obtained from interviews, observations, internal document analysis, and questionnaires conducted at CV Master Grafix in the period August–October 2024

Strategic Analysis - VRIO and Porter's Five Forces

VRIO analysis identifies organizational strengths and weaknesses across resource categories. Human resources demonstrate value through experienced designers and skilled production technicians, but lack rarity as similar capabilities exist among competitors. Training programs and knowledge management remain underdeveloped, limiting organizational learning potential. Physical resources including printing equipment and facility infrastructure provide adequate capacity but require modernization for competitive differentiation.

Technological resources represent significant gap in current capabilities. The company operates minimal IT infrastructure consisting of basic computers for design work and email communication, without enterprise systems, databases, or integrated platforms. This technological deficit constrains operational efficiency and strategic flexibility. However, the absence of legacy systems presents opportunity for implementing modern solutions without compatibility constraints.

Reputational resources emerge as valuable competitive asset built through 15 years of reliable service and quality delivery. Client relationships demonstrate loyalty with 70% repeat customer rate, though vulnerability exists to competitors offering superior service enabled by advanced technology. Customer service capabilities require enhancement through better information management and response coordination.

Porter's Five Forces analysis reveals moderate competitive intensity in product label printing industry. Supplier power is moderate, with established relationships among printing material vendors providing reasonable choice, though dependence on specific specialty materials creates some vulnerability. Buyer power is high, as clients can easily switch providers

and possess strong price negotiation leverage due to competitive market structure.

Competitive rivalry is intense, with numerous small-to-medium printers in Surabaya region competing primarily on price and delivery speed. Differentiation opportunities exist through quality consistency, design capabilities, and customer service, but current operational limitations prevent full exploitation of these strategic positions. The threat of substitutes remains low, as digital labels and alternative packaging solutions serve different market segments. Threat of new entrants is moderate, with low capital barriers but moderate technical expertise requirements.

IS/IT Strategic Planning Framework Results

The strategic planning process generated comprehensive IS/IT strategy addressing multiple dimensions of organizational needs. The information technology strategy establishes three-layer architecture supporting scalable and integrated operations. Foundation layer comprises network infrastructure, server systems, and cloud platforms enabling reliable connectivity and data storage. Application layer defines enterprise systems supporting core processes and management functions. Interface layer ensures user-friendly access through web and mobile channels facilitating stakeholder engagement.

Technology platform selections prioritize cost-effectiveness, ease of use, and integration capabilities suitable for SME context. Cloud-based solutions minimize upfront capital investments and infrastructure management burdens. Open-source and commercial-off-the-shelf applications reduce custom development costs while providing proven functionality. Mobile-responsive designs accommodate field staff and remote stakeholders. Security measures include access controls, data encryption, and backup protocols protecting business information assets.

Information systems business strategy defines priority application portfolio supporting critical operational processes. Four core systems form integrated ecosystem addressing identified challenges. The Color Management System serves as digital repository of standardized color specifications linked to client accounts and product profiles. Features include Pantone-CMYK-RGB conversion algorithms, color matching simulation, batch tracking for consistency verification, and historical database supporting reorders.

The Design Approval System provides collaborative platform for client-designer-production coordination. Workflow management capabilities enforce systematic review processes with version control, approval tracking, and automated notifications. Cloud-based file sharing eliminates email attachments and ensures all stakeholders access current versions. Mobile app enables client reviews and approvals from any location, accelerating iteration cycles and reducing physical proof requirements.

The Raw Material Procurement System integrates inventory tracking, demand forecasting, and supplier management modules. Real-time inventory visibility enables automated reorder points based on consumption patterns and lead times. Demand forecasting utilizes historical production data and confirmed orders predicting material needs. Supplier performance scorecards evaluate quality, reliability, and cost metrics informing purchasing decisions. Integration with accounting system provides financial control and reporting capabilities.

The Performance Evaluation System establishes objective metrics framework for

employee assessment and development. Production staff metrics include output quantity, quality rates, efficiency ratios, and safety compliance. Design team metrics cover project completion times, revision rates, client satisfaction scores, and portfolio development. Automated data capture from operational systems reduces manual documentation burdens while ensuring accuracy. Dashboard visualizations support performance discussions and development planning.

CONCLUSION

This research successfully develops comprehensive strategic IS/IT planning for CV Master Grafix using Ward and Peppard framework, addressing critical operational inefficiencies in product label printing operations through systematic technology adoption. Current state analysis reveals substantial challenges stemming from manual processes in color management, design approval workflows, raw material procurement, and performance evaluation, collectively reducing operational efficiency by approximately 15-20% and limiting competitive positioning. Strategic analysis through VRIO and Porter's Five Forces identifies technological capabilities as primary gap while recognizing valuable human resources and client relationships as foundation for competitive differentiation. The strategic planning process generates integrated IS/IT framework comprising technology infrastructure strategy establishing cloud-based three-layer architecture, information systems business strategy defining priority application portfolio addressing core operational processes, and IS/IT management strategy establishing governance structures and implementation roadmap. ANP-BOC prioritization method determines Color Management System as highest priority delivering immediate operational improvements, followed by Design Approval System, Raw Material Procurement System, and Performance Evaluation System forming integrated ecosystem. The four-phase implementation roadmap balances quick wins with foundational capabilities over 24-month period, requiring total investment of IDR 450 million with projected payback within 2.5 years through cost savings and revenue enhancements. Expected outcomes include 50% reduction in color-related complaints, 40% faster design iteration cycles, 60% reduction in procurement stockouts, and 20% productivity improvement, collectively transforming operational capabilities and competitive positioning. Research contributions include contextualized IS/IT strategic planning for product label printing SME, practical demonstration of Ward and Peppard framework application in traditional manufacturing setting, and integration of ANP-BOC methodology for stakeholder-driven application prioritization. Recommendations for future research include longitudinal study tracking implementation outcomes and long-term organizational impacts, comparative analysis across multiple SMEs validating framework generalizability, and exploration of emerging technologies including artificial intelligence for color matching and predictive procurement algorithms enhancing strategic planning relevance for evolving technological landscape.

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