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# LEVERAGING DIGITAL PROCESS MANAGEMENT FOR ATTAINING A TACTICAL EDGE IN MEETING THE COMPLIANCE OF BENCHMARKED QUALITY 4.0

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## ABSTRACT

*This study delves into the intersection of Quality 4.0 and green business process management (GBPM) as potent strategies for enhancing competitive advantage within organizations. Quality 4.0, a novel quality management approach rooted in Industry 4.0 technologies and digitalization, is explored alongside the principles of GBPM, which are recognized as pivotal in maintaining production efficiency and sustainability. Through empirical analysis conducted in the food manufacturing industry of Dubai, UAE, this study investigates the perceived impact of Quality 4.0 and GBPM on competitive advantage. Data from 216 respondents across 66 food manufacturing companies were collected and analyzed, employing rigorous statistical methods to assess the hypothesized model and mediating effect of Quality 4.0. The findings underscore the significant influence of GBPM on competitive advantage, mediated by Quality 4.0. These insights offer valuable knowledge for manufacturers, industrialists, and researchers, highlighting the potential benefits of implementing Quality 4.0, such as enhanced quality, efficiency, innovation, decision-making, and market differentiation.*

## INTRODUCTION

The current technological landscape is igniting a fourth industrial revolution, reshaping business models with real-time data and insights. Quality 4.0 emerges as a catalyst, empowering businesses to make agile, well-informed decisions, thus enhancing adaptability and fostering growth. However, harnessing the full potential of modern IT poses challenges amidst the rapid proliferation of emerging technologies such as artificial intelligence (AI), blockchain, and the Internet of Things (IoT). In response, organizations must adopt a new paradigm of green business process management (GBPM).

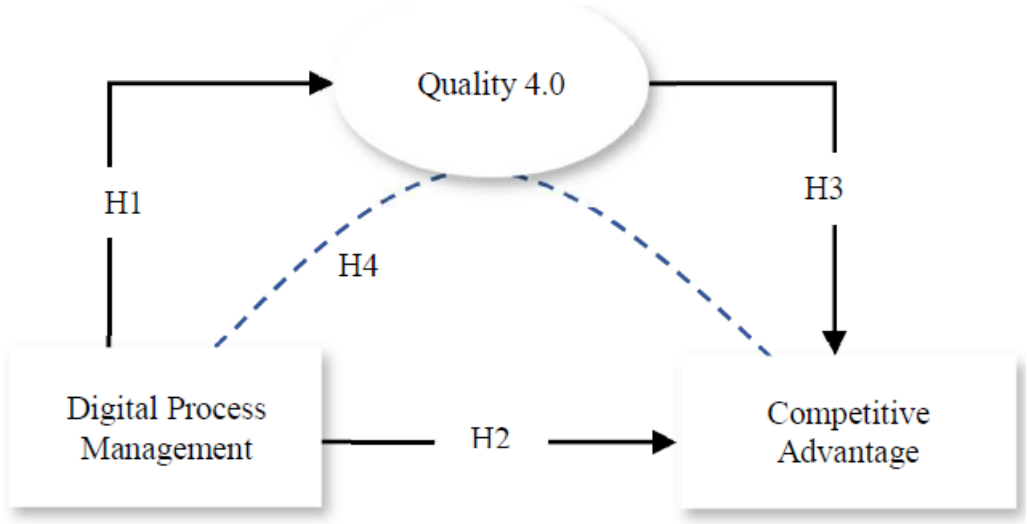


Figure 1: Research Model

### A. Green Business Process Management

Green business process management involves integrating sustainable practices into project management procedures. This encompasses incorporating environmental considerations into project planning, execution, and evaluation. Environmental impact assessments are conducted to gauge potential effects, guiding the implementation of measures to mitigate them. Establishing specific, measurable environmental targets aids in monitoring progress and evaluating project success. Utilizing eco-friendly materials and techniques during project construction and operation, along with implementing waste reduction strategies, further contributes to environmental sustainability. Continuous monitoring of environmental performance throughout the project lifecycle facilitates identification of areas for improvement and enables necessary adjustments.

### B. Quality 4.0

Quality 4.0 signifies the digital transformation of quality management systems, facilitating the automation of quality control processes. Leveraging digital technologies such as artificial intelligence, machine learning, and IoT, Quality 4.0 enhances productivity and efficiency, enabling businesses to produce higher quality goods at reduced costs. By gathering and analyzing data, Quality 4.0 enables businesses to gain deeper insights into customer needs and preferences, thereby optimizing product development and enhancing customer satisfaction and loyalty. Real-time data analysis empowers businesses to respond swiftly to market dynamics, identifying trends and adapting products and services to meet evolving consumer demands, thus gaining a competitive edge.

### C. Competitive Advantage

Competitive advantage arises when a company can offer similar benefits at lower costs or superior benefits compared to competitors. This concept challenges the notion of comparative advantage and underscores the importance of fostering high-quality product creation. National strategies

should prioritize productivity enhancement to drive economic growth. Competitive advantage hinges on satisfying customers with value-added products and increasing incomes.

# METHODS

Structural equation modeling (SEM) was employed to evaluate the research model. This approach facilitated the simultaneous testing of hypotheses and the examination of path relationships. A quantitative methodology using convenient sampling was adopted, gathering data from employees in the food manufacturing sector in Dubai, UAE. An online questionnaire was distributed to 66 food manufacturing companies via email, with 216 respondents providing data for model evaluation. The questionnaire, developed by the author, comprised 19 items assessing three constructs: Green Business Process Management (GBPM) with 5 items, Quality 4.0 (Q4.0) with 6 items, and Competitive Advantage (CA) with 8 items. Responses were recorded on a five-point Likert scale ranging from "1" (strongly disagree) to "5" (strongly agree).

Table 1: Descriptive Analysis, VIF, Factor Loadings, and Convergent Validity.

| Construct | Items | VIF | Loadings | Mean | Standard Deviation | Cronbach's Alpha | CR (rho c) | AVE |
|---|---|---|---|---|---|---|---|---|
| Green Business Process Management | GBPM1 | 1.808 | 0.845 | 3.33 | 1.12 | 0.868 | 0.897 | 0.524 |
| | GBPM2 | 2.168 | 0.818 | 3.14 | 1.70 | | | |
| | GBPM3 | 1.988 | 0.723 | 3.44 | 0.94 | | | |
| | GBPM4 | 1.208 | 0.891 | 2.98 | 1.12 | | | |
| | GBPM5 | 1.344 | 0.821 | 3.87 | 1.56 | | | |
| Quality 4.0 | Q4.0 1 | 1.976 | 0.777 | 3.22 | 1.89 | 0.884 | 0.915 | 0.683 |
| | Q4.0 2 | 1.045 | 0.872 | 3.13 | 1.44 | | | |
| | Q4.0 3 | 1.322 | 0.863 | 2.77 | 0.66 | | | |
| | Q4.0 4 | 1.658 | 0.912 | 4.66 | 1.41 | | | |
| | Q4.0 5 | 1.432 | 0.899 | 3.67 | 1.09 | | | |
| | Q4.0 6 | 1.477 | 0.847 | 3.56 | 1.55 | | | |
| Competitive Advantage | CA1 | 1.975 | 0.741 | 3.65 | 1.90 | 0.847 | 0.888 | 0.526 |
| | CA2 | 1.522 | 0.759 | 3.45 | 1.55 | | | |
| | CA3 | 1.765 | 0.859 | 3.64 | 0.94 | | | |
| | CA4 | 2.076 | 0.819 | 4.89 | 1.41 | | | |
| | CA5 | 1.546 | 0.732 | 3.24 | 1.48 | | | |
| | CA6 | 1.646 | 0.813 | 3.43 | 1.20 | | | |
| | CA7 | 2.022 | 0.744 | 3.54 | 1.91 | | | |
| | CA8 | 1.744 | 0.823 | 3.44 | 1.45 | | | |

*GBPM= Green Business Process Management, Q4.0= Quality 4.0, CA=Competitive Advantage, CR=Composite Reliability, VIF=Variance Inflation Factor, AVE=Average Variance Extracted*

## A. Data Analysis

Variance-based Partial Least Squares Structural Equation Modeling (PLS-SEM) was employed for data analysis. This method allows simultaneous examination of relationships between various variables, including latent constructs. Indicators' values were assessed using established techniques such as Average Variance Extracted (AVE), Composite Reliability (CR), and Cronbach's Alpha. Additionally, reliability analysis ensured internal consistency of the model. Collinearity issues were assessed through Variance Inflation Factor (VIF) values, with values below 0.5 indicating absence of collinearity. Results indicated robustness of the model, as evidenced by acceptable convergent validity values (>0.50 and >0.60) and confirmation of reliability and validity of constructs through measurement methodology.

## B. Structured Model Assessment

The Partial Least Squares (PLS) method was employed to calculate path coefficients, while bootstrapping with 5000 resamples was conducted to determine the significance level of these coefficients (p=0.05). Initially, R-square values were evaluated to ascertain the explanatory power of exogenous factors on endogenous variables. The model elucidated 58.2% of the variance in Green Business Process Management (GBPM) and 72.7% of the variance in Quality 4.0 (Q4.0).

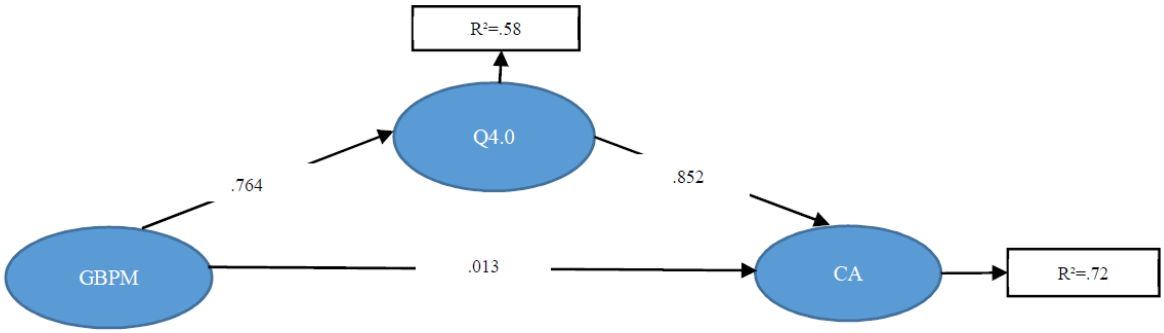


Figure 2: Measurement Model Output

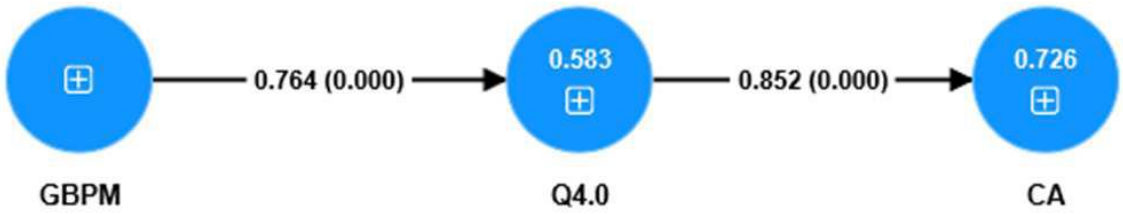


Figure 3: Mediating effect of Quality 4.0

Consequently, the study's first hypothesis, positing the influence of Green Business Process Management on Quality 4.0, was supported. GBPM significantly influenced Q4.0 (β = 0.76, t = 7.71, p=0.000), affirming H1, while H2 received support (β= 0.013, t=15.1, p=0.000), indicating a significant impact of GBPM on Competitive Advantage (CA). Furthermore, Quality 4.0 exhibited a significant influence on CA (β= 0.852, t = 8.27, p=0.000), supporting H3. Investigation into the mediating role of Quality 4.0 in the GBPM-CA relationship revealed significant indirect effects (β = 0.610, t = 7.50, p = 0.000), confirming partial mediation.

The mediating effect of Q4.0 in the GBPM-CA relationship is illustrated in the figures below (Figure 2 & 3), where the proposed model was assessed using the Structural Equation Modelling (SEM) algorithm. Results of the PLS-SEM test for model constructs indicated significance, with Quality 4.0 exhibiting a significant mediating role, supporting partial mediation between GBPM and CA.

## DISCUSSION

This study contributes significantly to the understanding of Green Business Process Management in the food manufacturing industry, offering valuable implications for industrial managers. Findings contribute to both theory and practice, highlighting the potential of implementing GBPM with Quality 4.0 to enhance competitive advantage, cost reduction, manufacturing efficiency, and time efficiency. Particularly noteworthy are the environmental benefits of GBPM, including reduced energy and water usage, waste output, and carbon footprint.

Moreover, the study extends prior research by affirming the positive mediating role of Quality 4.0 in enhancing competitive advantage. GBPM offers opportunities for cost savings, improved brand reputation, and compliance with environmental regulations. By streamlining production operations and meeting customer demand for eco-friendly products and services, food manufacturers can differentiate themselves in the market.

## CONCLUSIONS

In conclusion, this research successfully identified the role of Green Business Process Management in enhancing competitive advantage, with Quality 4.0 acting as a mediator. Quality 4.0 facilitates innovation, efficiency, improved decision-making, and a safer workplace, ultimately providing firms with a competitive edge. Implementing Quality 4.0 alongside GBPM offers numerous advantages, positioning firms for success in the dynamic food manufacturing industry.

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