CHAPTER 4.

DATA ANALYSIS AND DISCUSSION

4.1 Data Analysis

The research was conducted by distributing questionnaires to employees of the Supply Chain department in a Manufacturing Company. In this study, the population as well as the sample comprised employees of the Supply Chain department in a Manufacturing Company located in West Java, Indonesia, totalling 330 respondents. All respondents completed the questionnaires distributed via Google Forms, and all responses were fully completed. The statistical analysis results are as follows:

4.2 Characteristic of Research Respondent

All research respondents hold positions as managers or higher, work at companies that produce goods, and are permanent employees. Other characteristics of the research respondents include domicile, and gender. The detailed characteristics of the research respondents are presented in the following table:

Table 4.1 Characteristics of Research Respondent

Respondent Characteristic		f	%
Domisili	Banten	39	11.8
	DI Yogyakarta	18	5.5
	DKI Jakarta	153	46.4
	Jawa Barat	52	15.8
	Jawa Tengah	30	9.1
	Jawa Timur	38	11.5
Jenis Kelamin	Male	274	83.03
	Female	56	16.97
	Total	330	100.0

4.2.1 **Gender Distribution Analysis**

The gender distribution is heavily skewed towards male respondents, who constitute 83% of the sample. This imbalance in managerial roles could have implications for innovation capability within the FMCG sector. Gender diversity is often linked to a wider range of perspectives, which can foster innovative problem-solving and adaptability. In male-dominated environments, there might be a tendency toward traditional approaches, which could hinder the adoption of new technologies and quality management practices. Furthermore, research has shown that diversity in management is essential for creating dynamic capabilities, particularly in fostering a culture of innovation. The lack of gender diversity in this sample may impact the operational effectiveness and adaptability required for complex supply chain functions, as well as the successful implementation of advanced supply chain technologies.

The pie chart below illustrates the gender distribution of the respondents:

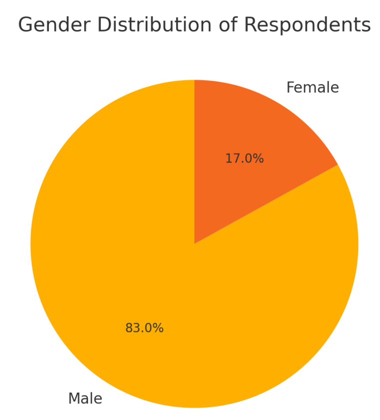

Fig 4.1 Gender Distribution Chart

4.2.2 Regional Distribution Analysis

The regional distribution reveals a significant concentration of respondents in DKI Jakarta (46.4%), followed by Jawa Barat and Banten. This concentration suggests that managerial talent and resources are centralized in Jakarta and nearby regions, likely due to the infrastructure, access to advanced technology, and skilled workforce available in these urban areas. These regions are better positioned to leverage technological advancements and enhance supply chain performance through innovation. In contrast, respondents from rural areas, such as Jawa Tengah and DI Yogyakarta, may face greater challenges in adopting new supply chain technologies. Limited access to skilled personnel and technological infrastructure in rural regions could hinder the operational capabilities and innovation potential necessary for optimizing supply chain performance. The challenges observed in rural settings, as highlighted in your study, indicate a need for region-specific strategies to bridge performance gaps.

The bar chart below shows the distribution of respondents by region:

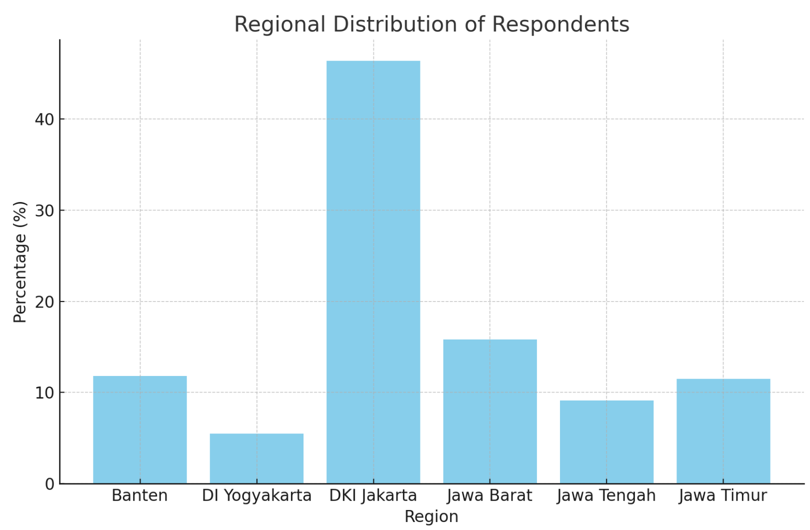

Fig 4.2 Regional Distribution Chart

The demographic analysis reveals significant insights into the regional and gender distributions within FMCG managerial roles. The concentration of managerial talent in Jakarta and surrounding regions aligns with higher operational and innovation capabilities in these areas, while rural regions may require additional support to achieve comparable supply chain performance. The gender imbalance in managerial positions could limit the diversity-driven innovation needed to adopt new supply chain technologies effectively. To address these disparities, FMCG companies should consider strategies that promote gender diversity and support rural regions in enhancing their operational and innovation capabilities. By understanding these demographic trends, companies can better align their efforts to improve supply chain performance, particularly through the integration of advanced technologies and robust quality management systems.

4.3 Descriptive Analysis of Respondents

The questionnaire in this study uses a Likert scale from 1 to 5, where a score of 1 indicates "strongly disagree," and a score of 5 indicates "strongly agree." Based on this scale, an interval scale is formed using the formula: (maximum value - minimum value) / maximum Likert scale.

Table 4.2. Value scale

Value	Category
1.0 - 1.8	Strongly Disagree
1.8 - 2.6	Disagree
2.6 - 3.4	Neutral
3.4 - 4.2	Agree
4.2 - 5.0	Strongly Agree

4.3.1 Descriptive Analysis Supply Chain Operation Abilities

Table 4.3. Value scale Supply Chain Operation Abilities

Code	Indicator	Mean	Min	Max	SD	Category
SCO1	Unit Bisnis Saya bertukar lebih banyak informasi dengan mitra perusahaan dibandingkan dengan pesaing perusahaan dengan mitra mereka	4.248	1.000	5.000	0.559	Strongly Agree
SCO2	Informasi mengalir lebih bebas antara Unit Bisnis saya dibandingkan antara pesaing perusahaan bersama mitra mereka.	4.036	1.000	5.000	1.017	Agree
SCO3	Unit Bisnis Saya mendapat manfaat lebih besar dari pertukaran informasi dengan mitra perusahaan dibandingkan pesaing perusahaan dari mitra mereka	4.312	2.000	5.000	0.588	Strongly Agree
SCO4	Pertukaran informasi kita dengan mitra kita lebih unggul dibandingkan pertukaran informasi yang dilakukan pesaing kita dengan mitra merek	4.330	2.000	5.000	0.560	Strongly Agree
SCO5	Unit Bisnis Saya lebih efisien dalam melakukan aktivitas koordinasi dengan mitra perusahaan dibandingkan pesaing perusahaan dengan mitra mereka	4.294	2.000	5.000	0.572	Strongly Agree
SCO6	Unit Bisnis Saya melakukan aktivitas tindak lanjut transaksi dengan mitra perusahaan secara lebih efisien dibandingkan dengan pesaing perusahaan dengan mitra mereka.	4.270	2.000	5.000	0.563	Strongly Agree
SCO7	Unit Bisnis Saya menghabiskan lebih sedikit waktu untuk mengoordinasikan transaksi dengan mitra perusahaan dibandingkan dengan pesaing perusahaan dengan mitra mereka.	4.015	1.000	5.000	1.083	Agree
SCO8	Unit Bisnis Saya telah mengurangi biaya	3.952	1.000	5.000	1.116	

Code	Indicator	Mean	Min	Max	SD	Category
	koordinasi lebih banyak dibandingkan pesaing perusahaan					
SCO9	Unit Bisnis Saya dapat melakukan kegiatan koordinasi dengan biaya lebih murah dibandingkan pesaing perusahaan	4.121	2.000	5.000	0.631	Agree
SCO10	Unit Bisnis Saya mengembangkan rencana strategis bekerja sama dengan mitra perusahaan.	4.458	2.000	5.000	0.495	Strongly Agree
SCO11	Unit Bisnis saya berkolaborasi aktif dalam peramalan sekaligus perencanaan bersama mitra perusahaan	4.421	3.000	5.000	0.45	Strongly Agree
SCO12	Unit Bisnis saya memproyeksikan permintaan masa depan sekaligus merencanakan secara kolaboratif bersama mitra perusahaan	4.364	2.000	5.000	0.516	Strongly Agree
SCO13	Kolaborasi dalam peramalan sekaligus perencanaan permintaan bersama mitra perusahaan selalu dilakukan di Unit Bisnis saya	4.370	2.000	5.000	0.511	Strongly Agree
SCO14	Unit Bisnis saya selalu memperkirakan sekaligus merencanakan kegiatan secara kolaboratif bersama mitra perusahaan	4.424	2.000	5.000	0.542	Strongly Agree
SCO15	Dibandingkan dengan pesaing, rantai pasokan kita merespons perubahan kebutuhan pelanggan sekaligus pemasok dengan lebih cepat serta efektif.	4.379	2.000	5.000	0.538	Strongly Agree
SCO16	Dibandingkan dengan pesaing, rantai pasokan kita merespons perubahan strategi pesaing dengan lebih cepat serta efektif.	4.418	2.000	5.000	0.530	Strongly Agree
SCO17	Dibandingkan pesaing perusahaan, rantai pasokan perusahaan mengembangkan sekaligus memasarkan produk baru dengan lebih cepat serta efektif.	4.391	2.000	5.000	0.522	Strongly Agree
SCO18	Di sebagian besar pasar,	4.430	2.000	5.000	0.517	Strongly

Code	Indicator	Mean	Min	Max	SD	Category
	rantai pasokan perusahaan bersaing secara efektif					Agree
SCO19	Hubungan dengan mitra perusahaan telah meningkatkan respons rantai pasokan perusahaan terhadap perubahan pasar melalui kolaborasi	4.579	3.000	5.000	0.402	Strongly Agree

The descriptive analysis of Supply Chain Performance indicators shows a generally strong perception of the supply chain's effectiveness in supporting key organizational goals, such as market share growth, cost reduction, timely product delivery, and inventory management. Among these indicators, PSC7—which measures the supply chain's contribution to increasing market share—received the highest mean score of 4.485. This suggests that respondents strongly agree that the supply chain plays a significant role in helping the company expand its market presence. Such a high score highlights the effectiveness of the supply chain in meeting customer demands, ensuring product availability, and maintaining competitive service levels, all of which are crucial for capturing and sustaining market share. This strength can be a valuable strategic asset, positioning the supply chain as a key driver of business growth and competitive advantage.

In contrast, PSC1, which assesses the supply chain's ability to reduce production costs, has the lowest mean score at 4.258. Although still a positive score, it suggests a perception of moderate effectiveness in this area relative to other performance aspects. This slightly lower score may indicate room for further optimization to enhance cost efficiency, which is essential for maximizing profitability. Potential areas for improvement could include streamlining processes, adopting lean practices, or enhancing supplier management to achieve greater cost savings. Improving in this area would not only benefit the company’s bottom line but also provide flexibility for competitive pricing strategies, which could support continued market share growth.

Other high-scoring indicators, such as timely product delivery (PSC5) with a mean of 4.452 and inventory management (PSC6) with a mean of 4.482, reflect the supply chain’s capability in ensuring reliable delivery and reducing stockouts. High performance in these areas is crucial for customer satisfaction and operational stability, as they indicate effective demand forecasting, inventory control, and logistics processes. The overall consistency in respondents' perceptions, as shown by low standard deviations across all indicators, suggests a shared positive view of the supply chain's capabilities.

In summary, while the organization’s supply chain is perceived as particularly effective in supporting market share growth, timely delivery, and inventory management, there is an opportunity to enhance cost reduction strategies. By addressing this area, the company can further optimize its supply chain performance, reinforcing its competitive positioning and enabling sustainable growth.

4.3.2 Descriptive Analysis Supply Chain Technology

Table 4.4. Value scale Supply Chain Technology

Code	Indicator	Mean	Min	Max	SD	Category
SCT1	Perusahaan menggunakan teknik berbantuan komputer (CAE)	4.336	1.000	5.000	0.649	Strongly Agree
SCT2	Perusahaan menggunakan desain dengan bantuan komputer	4.445	2.000	5.000	0.538	Strongly Agree
SCT3	Perusahaan menggunakan peralatan mesin komputer yang dikontrol secara numerik	4.342	1.000	5.000	0.578	Strongly Agree

Code	Indicator	Mean	Min	Max	SD	Category
SCT4	Perusahaan menggunakan inspeksi berbantuan komputer (CAI)	4.333	2.000	5.000	0.601	Strongly Agree
SCT5	Perusahaan menggunakan kendaraan berpemandu otomatis (AGV)	4.106	1.000	5.000	1.100	Agree
SCT6	Perusahaan menggunakan sistem penanganan material otomatis	4.309	1.000	5.000	0.613	Strongly Agree
SCT7	Perusahaan menggunakan penyimpanan otomatis	4.412	1.000	5.000	0.588	Strongly Agree
SCT8	Ada hubungan langsung komputer-ke-komputer dengan mitra rantai pasokan utama perusahaan	4.406	2.000	5.000	0.551	Strongly Agree
SCT9	Sistem TI perusahaan kompatibel dengan sistem mitra rantai pasokan perusahaan	4.445	1.000	5.000	0.518	Strongly Agree
SCT10	Sistem TI perusahaan dapat terhubung secara lancar dengan sistem mitra rantai pasokan	4.439	2.000	5.000	0.517	Strongly Agree
SCT11	Perusahaan mengirimkan informasi kepada pelanggan utama perusahaan secara elektronik	4.458	3.000	5.000	0.462	Strongly Agree
SCT12	Perusahaan menerima informasi dari pelanggan perusahaan secara elektronik	3.645	1.000	4.000	0.415	Agree

The descriptive analysis for Supply Chain Technology indicators provides a comprehensive view of the technological capabilities within the company's supply chain, highlighting the highest and lowest mean scores to assess strengths and areas for potential improvement.

The indicator with the highest mean score is SCT11 (mean = 4.458), which refers to the company's capability to send information to main customers electronically. This high score suggests that respondents strongly agree on the effectiveness of electronic information sharing with key customers. This capability is vital in today's digital age, as electronic communication enables real-time information exchange, enhances transparency, and strengthens customer relationships. The high mean score here reflects a robust commitment to leveraging technology for customer communication and operational efficiency, suggesting that electronic systems are well-integrated and are a key component of the company's supply chain operations.

On the other end, the indicator with the lowest mean score is SCT12 (mean = 3.645), which assesses the company's ability to receive information from customers electronically. This score, while still above the midpoint, is notably lower than the other indicators, suggesting a relatively weaker capability or satisfaction in this area. The lower mean score may imply that although the company is effective at sending information, there might be limitations or inefficiencies in receiving customer data, which could hinder responsiveness and adaptability. Addressing this gap could further enhance the company's data integration and customer responsiveness, potentially improving demand forecasting, inventory management, and customer satisfaction.

Overall, the analysis highlights that while the company has strong capabilities in electronically communicating with customers, there is an opportunity to improve the systems or processes for receiving information. Strengthening this aspect of supply chain technology could create a more comprehensive, two-way data flow, enhancing the organization's adaptability and overall performance in meeting customer needs.

4.3.3 Descriptive Analysis Quality management

Table 4.5. Value scale Quality Management

Code	Indicator	Mean	Min	Max	SD	Category
QM1	Siklus plan do check act	4.358	2.000	5.000	0.562	Strongly

Code	Indicator	Mean	Min	Max	SD	Category
	diterapkan sekaligus digunakan untuk peningkatan kualitas berkelanjutan.					Agree
QM2	Data atau laporan berkualitas digunakan untuk membantu pengambilan keputusan.	4.509	2.000	5.000	0.517	Strongly Agree
QM3	Anggota staf terlibat dalam berbagai proses manajemen mutu sekaligus mengetahui cara mengevaluasinya.	4.515	2.000	5.000	0.456	Strongly Agree
QM4	Mutu pelayanan atau produk pada institusi ini ditetapkan;	4.476	2.000	5.000	0.499	Strongly Agree
QM5	kualitas layanan telah dievaluasi melalui pencatatan kesalahan atau keluhan;	3.597	2.000	4.000	0.377	Agree
QM6	Layanan pemantauan tahunan dilakukan melalui survei kepuasan klien internal sekaligus eksternal.	4.421	2.000	5.000	0.549	Strongly Agree
QM7	Pelatihan tahunan tentang manajemen mutu diberikan kepada seluruh staf	4.603	2.000	5.000	0.444	Strongly Agree
QM8	Perusahaan selalu membuat laporan pelaksanaan penjaminan mutu setiap tahunnya	4.548	2.000	5.000	0.504	Strongly Agree
QM9	institusi ini mempertimbangkan kebutuhan klien secara sistematis;	4.439	2.000	5.000	0.515	Strongly Agree
QM10	Perusahaan memastikan seluruh tahapan pemberian layanan diuji sekaligus terkoordinasi dengan baik.	4.515	2.000	5.000	0.510	Strongly Agree
QM11	Perusahaan menggunakan statistik untuk membantu mengevaluasi pengendalian kualitas sekaligus jaminan kualitas serta mendorong peningkatan kualitas.	4.458	2.000	5.000	0.546	Strongly Agree
QM12	Perusahaan menganalisis manajemen untuk meningkatkan layanan	4.570	2.000	5.000	0.441	Strongly Agree

The indicator with the highest mean score is QM7 (mean = 4.603), which pertains to the provision of annual quality management training to all staff members. This high score reflects strong agreement among respondents that the organization prioritizes continuous training on quality practices, underscoring a commitment to maintaining and enhancing quality standards. Regular training is crucial as it ensures that employees are updated on the latest quality protocols, which can lead to consistent quality improvements, heightened awareness of quality standards, and a proactive approach to quality management. This strong emphasis on training suggests that the organization views staff education as a foundational component of its quality assurance efforts.

Conversely, the indicator with the lowest mean score is QM5 (mean = 3.597), which evaluates the effectiveness of quality evaluations through recorded errors or complaints. Although still a positive score, it indicates a relatively lower satisfaction with this aspect of quality management. This could suggest that there may be gaps in the organization's current processes for capturing and utilizing feedback from errors or complaints to improve quality. A potential reason for this lower score might be a need for more systematic or rigorous tracking mechanisms, or for enhancing the ways in which such feedback is integrated into improvement strategies.

In conclusion, while the organization demonstrates a strong foundation in quality management—particularly in employee training—there may be opportunities to improve the processes related to feedback collection and analysis from errors or complaints.

4.3.4 Descriptive Analysis Innovation Capabilities

Table 4.6. Value scale Innovation Capabilities

Code	Indicator	Mean	Min	Max	SD	Category
IC1	Perusahaan telah	4.458	2.000	5.000	0.495	Strongly Agree

Code	Indicator	Mean	Min	Max	SD	Category
	mengembangkan lebih banyak kemampuan untuk memilih mitra untuk diajak berkolaborasi					
IC2	Perusahaan telah mengembangkan lebih banyak kemampuan untuk belajar dari pengalaman kolaborasi sebelumnya	4.506	2.000	5.000	0.481	Strongly Agree
IC3	Perusahaan telah mengembangkan lebih banyak kemampuan untuk menerapkan konsep perbaikan berkelanjutan sekaligus fokus pelanggan.	4.485	2.000	5.000	0.508	Strongly Agree
IC4	Perusahaan telah mengembangkan lebih banyak kemampuan untuk memahami interkoneksi manajemen rantai pasokan dengan disiplin ilmu lain.	4.348	2.000	5.000	0.586	Strongly Agree
IC5	Perusahaan telah mengembangkan lebih banyak kemampuan untuk mengelola peningkatan sekaligus perubahan bertahap pada produk, proses, serta sistemnya.	4.497	1.000	5.000	0.508	Strongly Agree

The indicator with the highest mean score is IC2 (mean = 4.506), which measures the company's ability to learn from previous collaboration experiences. This high score indicates a strong agreement among respondents, suggesting that the organization values and effectively leverages past experiences to refine its collaborative practices. Such a capability is essential in fostering a learning-oriented culture, where insights gained from partnerships are actively used to enhance future collaborations, improve processes, and drive innovation. This focus on learning from collaboration aligns with the principles of continuous improvement and strategic adaptability, positioning the company well to manage dynamic industry conditions.

The indicator with the lowest mean score is IC4 (mean = 4.348), which assesses the organization's understanding of the interconnections between supply chain management and other disciplines. Although this score is still relatively high, it is slightly lower than other innovation capabilities, indicating that there may be room to strengthen cross-disciplinary knowledge. Enhancing this capability could enable the organization to integrate broader perspectives into supply chain strategies, fostering more comprehensive and innovative solutions that go beyond traditional boundaries.

In summary, the organization shows strong innovation capabilities, particularly in learning from collaborative experiences and managing incremental improvements in products, processes, and systems. However, improving cross-disciplinary understanding could further bolster the company's innovation framework, enabling more holistic and forward-thinking approaches in supply chain management and beyond.

4.3.5 Descriptive Analysis Supply Chain Performance

Table 4.7. Value scale Supply Chain Performance

Code	Indicator	Mean	Min	Max	SD	Category
PSC1	Rantai pasokan membantu kita mengurangi biaya produksi	4.258	2.000	5.000	0.618	Strongly Agree
PSC2	Rantai pasokan membantu kita mengurangi total biaya	4.297	1.000	5.000	0.608	Strongly Agree
PSC3	Rantai pasokan membantu kita mengurangi biaya inventaris	4.264	2.000	5.000	0.600	Strongly Agree
PSC4	Rantai pasokan membantu perusahaan meningkatkan daya tanggap/layanan pelanggan	4.373	2.000	5.000	0.511	Strongly Agree
PSC5	Rantai pasokan membantu perusahaan mengirimkan produk tepat waktu	4.452	2.000	5.000	0.559	Strongly Agree
PSC6	Rantai pasokan membantu kita mengurangi tingkat kehabisan stok	4.482	2.000	5.000	0.598	Strongly Agree
PSC7	Rantai pasokan membantu perusahaan meningkatkan	4.485	2.000	5.000	0.547	Strongly Agree

Code	Indicator	Mean	Min	Max	SD	Category
	pangsa pasar					

The indicator with the highest mean score is PSC7 (mean = 4.485), which relates to the supply chain's role in increasing the company's market share. This high score reflects strong agreement among respondents that the supply chain effectively contributes to the company's competitive positioning and expansion in the market. A supply chain that supports market share growth suggests well-optimized processes that align with customer demand, enhance service levels, and ensure product availability, all critical for maintaining a competitive edge. This indicates that the supply chain is not only operationally efficient but also strategically aligned with the company's business growth objectives.

On the other hand, the indicator with the lowest mean score is PSC1 (mean = 4.258), which assesses the supply chain's effectiveness in reducing production costs. While this score remains high, it suggests a relatively lower satisfaction in cost reduction compared to other performance metrics. This finding could imply that while the supply chain supports cost management, there may be additional opportunities to streamline processes, reduce waste, or negotiate supplier contracts to achieve further savings. Enhancing cost reduction strategies within the supply chain could improve profitability and enable the company to reinvest in other strategic areas, such as technology upgrades or market expansion.

Overall, the analysis suggests that the organization's supply chain is perceived as highly effective in supporting timely delivery, minimizing stockouts, and growing market share, while also demonstrating solid capabilities in customer responsiveness and inventory management. To maximize performance, the company could focus on further cost reduction measures, which would complement its strengths and ensure a balanced approach to both operational efficiency and market competitiveness.

4.4 Inferential Analysis

The data processing technique using the Partial Least Squares (PLS)-based Structural Equation Modeling (SEM) method requires two stages to assess the Fit Model of a research model (Ghozali, 2019). These stages are as follows:

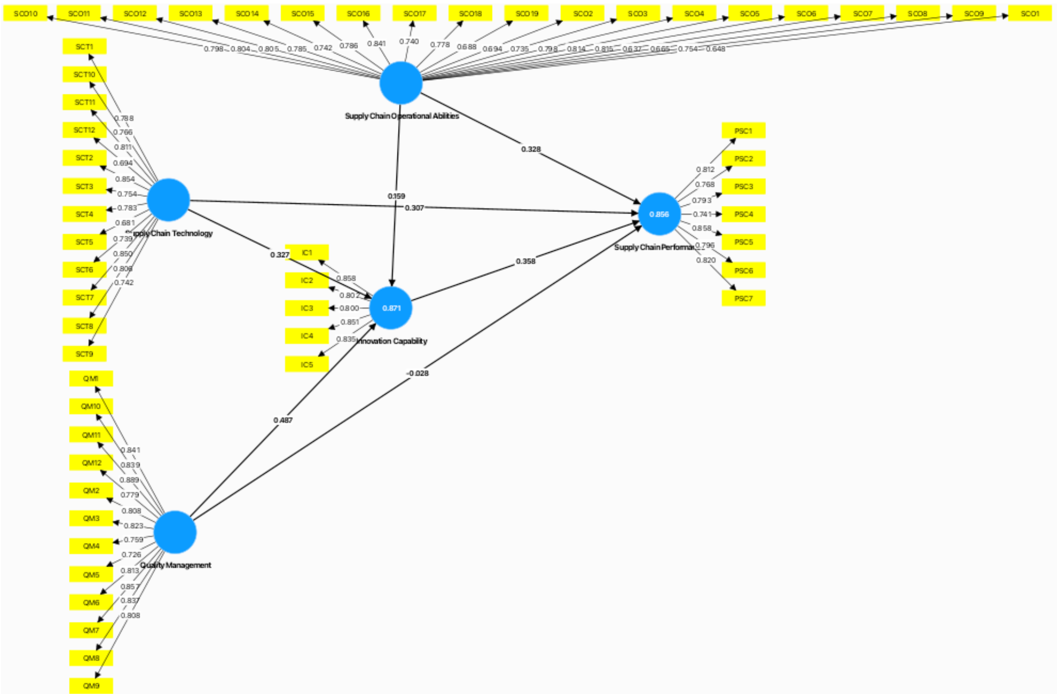

Fig 4.3 Outer Model Analysis or Research Measurement Model

4.4.1 Outer Loading

In refining the model, indicators across all constructs were carefully evaluated for removal based on their contribution to reliability, discriminant validity, and multicollinearity, as measured by Variance Inflation Factor (VIF) values. By retaining only the indicators with high outer loadings, the model achieves a more focused measurement of each construct, reducing redundancy and ensuring that each construct remains both distinct and reliable.

For Innovation Capabilities (IC), the indicators IC2, IC4, and IC5 were retained due to their high outer loadings, all above 0.80, which indicates strong alignment with the core dimensions of innovation. Indicators like IC1 and IC3 were removed, as their lower loadings suggested they contributed less consistently to the construct. This selective retention strengthens the construct's reliability by focusing on indicators that best represent the capability to innovate, learn, and collaborate effectively. Additionally, removing these lower-loading indicators helps to enhance discriminant validity, as it minimizes overlap with other constructs that could blur the unique aspects of innovation capabilities.

In Supply Chain Performance (PSC), only PSC1, PSC5, PSC6, and PSC7 were maintained. These indicators exhibited strong outer loadings, signifying their crucial role in capturing the construct's core components, such as cost efficiency, timely delivery, and market responsiveness. Indicators like PSC2, PSC3, and PSC4 were excluded, as their relatively lower loadings made them less essential to the construct's overall integrity. By refining the construct to focus on the strongest indicators, the model not only boosts reliability but also reduces multicollinearity risks, as confirmed by improved VIF values. The elimination of these weaker indicators ensures that Supply Chain Performance remains a distinct and clear measure, free from the redundancies that could undermine its interpretive power.
Quality Management (QM) was similarly refined by retaining indicators QM2, QM3, QM6, and QM8, each of which demonstrated high loadings and strong alignment with the quality management construct. Indicators with lower loadings, such as QM4 and QM5, were removed to reduce measurement overlap and multicollinearity, thus enhancing the distinctiveness of Quality Management. The retained indicators effectively capture the essence of quality practices, such as

continuous improvement and adherence to standards, making the construct a robust measure of quality management efforts within the supply chain. This refinement process reinforces discriminant validity, ensuring that Quality Management is a separate construct that measures quality-related processes without interference from other dimensions.

In the case of Supply Chain Operational Capabilities (SCO), only SCO10, SCO11, SCO12, SCO16, and SCO4 were retained. Indicators with lower outer loadings, such as SCO7 and SCO8, were removed as they did not meet the threshold for reliable measurement and posed risks of multicollinearity, which could compromise the precision of the construct. The selected indicators focus on essential operational aspects like strategic alignment and collaborative planning, which are critical to operational success. By excluding weaker indicators, the model enhances the internal consistency and clarity of Supply Chain Operational Capabilities, allowing it to stand as a unique construct that is effectively differentiated from others.

Finally, for Supply Chain Technology (SCT), the retained indicators—SCT1, SCT2, SCT7, SCT8, and SCT9—exhibited high outer loadings, suggesting they are core measures of the construct. Indicators like SCT5 and SCT6 were removed due to their lower loadings, which could dilute the construct's specificity and introduce unwanted multicollinearity. By focusing on indicators that directly reflect technological integration and communication capabilities within the supply chain, the model strengthens both reliability and discriminant validity, ensuring that Supply Chain Technology is measured precisely and without overlap with other constructs.

In summary, the refined model excludes lower-loading indicators from each construct to maximize clarity, reliability, and distinctiveness. This selective retention minimizes multicollinearity, as evidenced by acceptable VIF values, and strengthens discriminant validity by ensuring each construct captures a unique aspect of the supply chain framework. Through this careful refinement process, the model achieves a robust structure where each construct is accurately represented by its most impactful indicators, thus enhancing the validity of the study's findings and ensuring confidence in the interpretation of results.

Table 4.8

Outer Loadings (Measurement Model) Pilot Data

	Innovation Capability	Quality Management	Supply Chain Operational Abilities	Supply Chain Performance	Supply Chain Technology	Result
IC2	0.841					**Reliable**
IC4	0.878					**Reliable**
IC5	0.863					**Reliable**
PSC1				0.802		**Reliable**
PSC5				0.893		**Reliable**
PSC6				0.875		**Reliable**
PSC7				0.861		**Reliable**
QM2		0.860				**Reliable**
QM3		0.864				**Reliable**
QM6		0.854				**Reliable**
QM8		0.863				**Reliable**
SCO10			0.859			**Reliable**
SCO11			0.846			**Reliable**
SCO12			0.862			**Reliable**

	Innovation Capability	Quality Management	Supply Chain Operational Abilities	Supply Chain Performance	Supply Chain Technology	Result
SCO16			0.874			**Reliable**
SCO4			0.841			**Reliable**
SCT1					0.823	**Reliable**
SCT2					0.875	**Reliable**
SCT7					0.899	**Reliable**
SCT8					0.849	**Reliable**
SCT9					0.840	**Reliable**

The processing results using SmartPLS can be seen in Table 4.8. The outer model values or correlations between constructs and variables initially already satisfy convergent validity because all indicators with loading factor values above 0.80

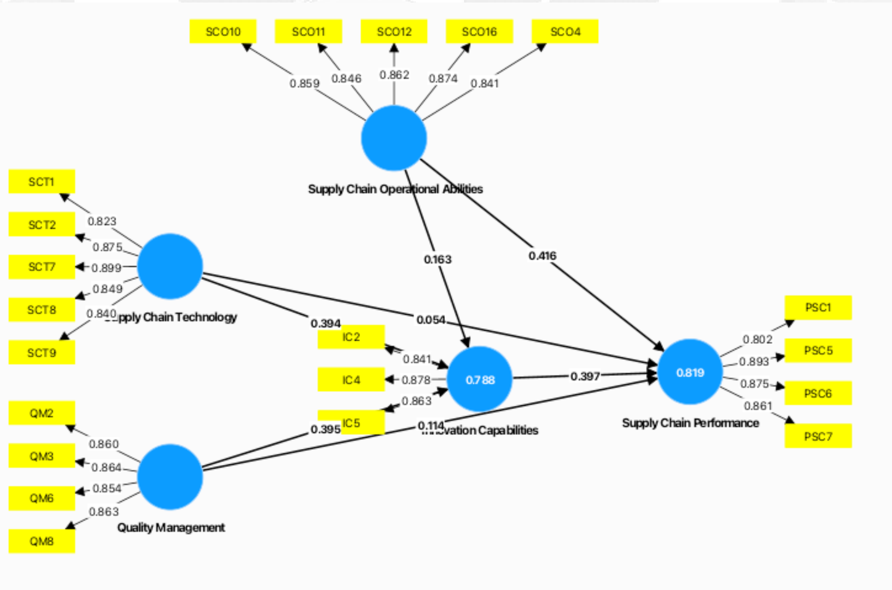

Fig 4.4 Reliable Outer Model Analysis

4.4.2 Construct Reliability and Validity

The analysis of Construct Reliability and Validity for this model, as indicated by Cronbach's Alpha and Composite Reliability values, confirms that each construct achieves a high level of internal consistency, deeming them all reliable. Both Cronbach's Alpha and Composite Reliability values exceed the standard threshold of 0.70, ensuring that each construct is measured precisely and consistently. This high reliability is essential for the accuracy and interpretability of the model, as it indicates that the indicators within each construct are well-aligned and cohesively represent the intended concepts.

Table 4.9 Composite Reliability

	Cronbach's alpha	Composite reliability	Result
Innovation Capabilities	0.825	0.827	Reliable
Quality Management	0.883	0.883	Reliable
Supply Chain Operational Capabilities	0.909	0.910	Reliable
Supply Chain Performance	0.881	0.884	Reliable
Supply Chain Technology	0.910	0.913	Reliable

For Innovation Capabilities, the Cronbach's Alpha is 0.825 and the Composite Reliability is 0.827, showing that the indicators are effectively capturing the innovation processes within the supply chain. Quality Management also exhibits high reliability with both Cronbach's Alpha and Composite Reliability values at 0.883, signifying that the construct accurately measures the quality practices and standards. Similarly, Supply Chain Operational Capabilities achieves strong internal consistency with a Cronbach's Alpha of 0.909 and Composite Reliability of 0.910, demonstrating that the indicators reliably represent core operational capabilities, such as responsiveness and efficiency in supply chain operations.

Supply Chain Performance has a Cronbach's Alpha of 0.881 and Composite Reliability of 0.884, reflecting that the indicators reliably measure key performance outcomes like cost reduction and timely delivery. Finally, Supply Chain Technology shows the highest reliability with a Cronbach's Alpha of 0.910 and Composite Reliability of 0.913, confirming that the indicators consistently capture aspects of technology integration and communication within the supply chain.

Each construct exhibits high reliability, as evidenced by both Cronbach's Alpha and Composite Reliability values above 0.80, which supports the model's robustness and credibility. This level of internal consistency minimizes measurement error and ensures that the constructs provide a precise and dependable assessment of the relationships among Innovation Capabilities, Quality Management, Operational Capabilities, Performance, and Technology in the supply chain context.

Convergent Validity

The Convergent Validity of the model, as assessed by the Average Variance Extracted (AVE) values, confirms that each construct meets the required threshold for validity. An AVE value of 0.50 or higher is generally considered acceptable, indicating that the construct explains at least 50% of the variance in its indicators. High AVE values support convergent validity, demonstrating that the indicators within each construct are well-aligned and measure the same underlying concept effectively.

Table 4.10 Average Variance Extracted

	Average variance extracted (AVE)	Result
Innovation Capabilities	0.741	Valid
Quality Management	0.740	Valid
Supply Chain Operational Capabilities	0.734	Valid
Supply Chain Performance	0.737	Valid
Supply Chain Technology	0.736	Valid

Based on the table, all constructs exceed the AVE threshold of 0.50, with values ranging from 0.734 to 0.741. Innovation Capabilities has an AVE of 0.741, showing that 74.1% of the variance in its indicators is due to the construct itself, rather than measurement error. This high AVE indicates a strong level of consistency among the indicators for Innovation Capabilities, reflecting effective measurement of innovation-related processes within the supply chain. Quality Management similarly shows a high AVE of 0.740, confirming that the indicators effectively capture quality practices and standards with minimal error, thus reinforcing the construct's validity.

Supply Chain Operational Capabilities has an AVE of 0.734, meaning that 73.4% of the variance in its indicators is attributable to the construct. This high value suggests that the indicators reliably measure operational capabilities, such as efficiency and responsiveness in the supply chain. Supply Chain Performance and Supply Chain Technology have AVE values of 0.737 and 0.736 respectively, demonstrating that their indicators are well-correlated and consistently capture performance outcomes and technological integration within the supply chain.

In conclusion, the AVE values confirm that each construct has strong convergent validity. This means that each set of indicators accurately reflects its intended construct, ensuring the internal consistency and reliability of the model.

The high AVE values across all constructs provide confidence that the model effectively captures key aspects of Innovation Capabilities, Quality Management, Operational Capabilities, Performance, and Technology, supporting the robustness of the research findings.

4.4.3 Discriminant Validity

The Fornell-Larcker Criterion is a method used to evaluate discriminant validity, which determines whether constructs that are conceptually distinct are also statistically distinct. Discriminant validity ensures that each construct in a model measures a unique concept and is not excessively correlated with other constructs. According to the Fornell-Larcker Criterion, a construct demonstrates discriminant validity if the square root of the Average Variance Extracted (AVE) for each construct is greater than its correlations with any other constructs in the model. This method is widely used in structural equation modelling (SEM) to confirm that each construct is independent and distinct from the others.

Table 4.11 Fornell-Larcker Criterion

	Innovation Capabilities	Quality Management	Supply Chain Operational Capabilities	Supply Chain Performance	Supply Chain Technology
Innovation Capabilities	0.861				
Quality Management	0.841	0.860			
Supply Chain Operational Capabilities	0.750	0.725	0.857		
Supply Chain Performance	0.850	0.794	0.837	0.859	
Supply Chain Technology	0.847	0.832	0.764	0.803	0.858

In Table 4.11, According to this criterion, each construct's square root of the average variance extracted (AVE), represented by the diagonal values, should be higher than its correlations with other constructs, indicated by the off-diagonal values. This requirement ensures that each construct shares more variance with its own indicators than with other constructs, thereby demonstrating adequate discriminant validity.

For example, the diagonal value for Innovation Capabilities is 0.861, which is greater than its correlations with other constructs, such as 0.841 with Quality Management and 0.847 with Supply Chain Technology. Similarly, the Quality Management construct has a diagonal value of 0.860, exceeding its correlations with other constructs. This pattern holds across the table for all constructs, indicating that each construct captures a distinct concept and maintains a unique identity within the model.

Additionally, some constructs, such as Supply Chain Technology, exhibit relatively high correlations with others, including Innovation Capabilities (0.847) and Supply Chain Performance (0.803). These high correlations suggest that Supply Chain Technology is strongly associated with both innovation and performance aspects within the supply chain, aligning with the theoretical assumption that technology enhances these areas.

In summary, the table confirms that all constructs meet the Fornell-Larcker criterion for discriminant validity. Each construct's square root of AVE exceeds its correlations with other constructs, ensuring that they are sufficiently distinct. This finding supports the validity and reliability of the measurement model used in the SEM analysis, affirming that each construct uniquely contributes to the overall model structure.

4.4.4 Inner Model

The testing of the inner model or structural model is conducted to observe the relationships between constructs, significance values, and R-square of the research model. The structural model is evaluated using R-square for the dependent constructs and the significance of the coefficients of structural path parameters. In Analyzing Inner model parameter that is used are Variance Inflation Factor (Inner VIF), R-square, f-square, Q-square, dan Q-square predict.

Inner VIF

The use of Inner VIF in model analysis is essential to verify that constructs in the model are not overly redundant or collinear. By keeping Inner VIF values below the threshold of 5, the model ensures that each construct explains unique variance in the inner model, which improves the precision of coefficient estimates and the reliability of interpretations. In this model, all constructs meet the VIF requirement, confirming that multicollinearity is at an acceptable level. This strengthens the model's structural validity, ensuring that relationships between constructs are not artificially inflated by high correlations, thereby supporting accurate hypothesis testing and conclusions.

Table 4.12 Inner Variance Inflation Factor (VIF)

	Innovation Capabilities	Quality Management	Supply Chain Operational Capabilities	Supply Chain Performance	Supply Chain Technology
Innovation Capabilities				4.720	
Quality Management	3.469			4.206	
Supply Chain Operational Capabilities	2.561			2.686	
Supply Chain Performance					
Supply Chain Technology	3.956			4.689	

The Inner Variance Inflation Factor (VIF) analysis confirms that multicollinearity among the constructs in the model is within acceptable limits, with all VIF values below the critical threshold of 5. This threshold is typically used to ensure that constructs do not overlap excessively, allowing each one to maintain a distinct role in explaining variance without redundancy. For instance, Innovation Capabilities has VIF values of 4.720 with Supply Chain Performance and 3.956 with Supply Chain Technology, suggesting that while it shares some variance with these constructs, it still contributes unique explanatory power within the model. Similarly, Quality Management shows VIF values of 3.469 with Innovation Capabilities and 4.206 with Supply Chain Performance, indicating an acceptable level of multicollinearity. These values reflect that Quality Management is sufficiently distinct, capturing unique aspects of quality practices without significant overlap with other constructs. Supply Chain Operational Capabilities has lower VIF values of 2.561 with Innovation Capabilities and 2.686 with Supply Chain Performance, highlighting that it provides independent information focused on operational efficiency and responsiveness within the model.

Finally, Supply Chain Technology exhibits VIF values of 3.956 with Innovation Capabilities and 4.689 with Supply Chain Performance. Although these values are slightly higher, they remain below the threshold of concern, affirming that Supply Chain Technology maintains its unique role, particularly in capturing aspects of technological integration. Overall, the VIF values confirm that each construct contributes distinct information to the model, supporting its structural validity and enhancing the reliability of the study's conclusions.

4.4.5 Coefficient of Determinant (R-Square)

The testing of the inner model or structural model is conducted to observe the relationships between constructs, significance values, and R-square of the research model. The structural model is evaluated using R-square for the dependent constructs and the significance of the coefficients of structural path parameters.

Table 4.13 R-Square Estimation

	R-square	R-square adjusted
Innovation Capabilities	0.788	0.786
Supply Chain Performance	0.819	0.817

The R-Square values in this table represent the proportion of variance in each dependent construct that is explained by the independent variables in the model. An R-Square value close to 1 indicates strong explanatory power, while a lower value would suggest that the model explains less of the variance in the dependent variable. The Adjusted R-Square corrects for the number of predictors in the model, providing a more accurate estimate, especially when multiple predictors are involved.

For Innovation Capabilities, the R-Square value is 0.788, meaning that 78.8% of the variance in Innovation Capabilities is explained by the independent variables included in the model. The adjusted R-Square of 0.786 shows only a slight reduction, indicating that the number of predictors does not overly inflate the explanatory power. This high R-Square value suggests that the predictors in the model are highly effective in explaining variations in Innovation Capabilities, capturing key elements that drive innovation within the supply chain.

Supply Chain Performance has an R-Square of 0.819, meaning that 81.9% of the variance in this construct is accounted for by the model. The adjusted R-

Square is 0.817, which again indicates minimal adjustment and reflects a strong fit. This high R-Square value implies that the independent variables are highly predictive of Supply Chain Performance, encompassing key factors that contribute to performance outcomes, such as operational efficiency and technological integration.

In summary, both Innovation Capabilities and Supply Chain Performance have high R-Square values, indicating that the model explains a substantial portion of the variance in these constructs. This strong explanatory power suggests that the chosen predictors are highly relevant and that the model is well-suited for analyzing the dynamics within the supply chain framework. The high R-Square values provide confidence in the model's capacity to capture essential aspects of Innovation Capabilities and Supply Chain Performance effectively.

4.5 Hypotheses Testing

The significance of the estimated parameters provides valuable information about the relationships between research variables. The basis used in testing hypotheses is the values found in the output result for inner weights, which can be seen in the following image and table:

Table 4.14 Hypothesis Test

	Path	Standardized Coefficient	T statistics	P value	Significance	Result
H1	Supply Chain Operational abilities -> Supply Chain Performance	0.416	6.759	0.000	Significant	Supported
H2	Supply Chain Technology -> Supply Chain Performance	0.054	0.762	0.223	Not Significant	Not Supported
H3	Quality Management -> Supply Chain Performance	0.114	1.718	0.043	Significant	Supported
H4	Supply Chain Operational abilities -> Innovation Capabilities -> Supply Chain Performance	0.065	3.933	0.000	Significant	Supported
H5	Supply Chain Technology -> Innovation Capabilities -> Supply Chain Performance s	0.156	5.135	0.000	Significant	Supported
H6	Quality Management -> Innovation Capabilities -> Supply	0.157	4.636	0.000	Significant	Supported

The hypotheses testing results presented in Table 4.14 provide a comprehensive view of the relationships between various constructs within the model, shedding light on both direct and indirect effects on Supply Chain Performance. Each hypothesis was evaluated based on the Standardized Coefficient, T-statistics, and P-values, with significance determined at a threshold of $p < 0.05$. The findings indicate that the majority of hypothesized relationships are significant, underscoring the intricate interdependencies between supply chain operational abilities, technology, quality management, innovation capabilities, and overall performance.

H1. Influence of Supply Chain Operational Abilities with Supply Chain Performance

which posits that Supply Chain Operational Abilities positively influence Supply Chain Performance, is supported. With a standardized coefficient of 0.416 and a T-statistic of 6.759 ($p = 0.000$), this path is highly significant, suggesting that enhancing operational capabilities—such as agility, responsiveness, and efficient resource management—has a direct and substantial impact on performance outcomes. This finding highlights the critical role of operational abilities in driving performance improvements and reinforces the importance of operational efficiency as a cornerstone of supply chain success.

H2, Influence Supply Chain Technology with Supply Chain Performance

which hypothesized a direct positive relationship between Supply Chain Technology and Supply Chain Performance, is not supported. This path has a low standardized coefficient of 0.054, a T-statistic of 0.762, and a p-value of 0.223, indicating that the relationship is not statistically significant. The lack of significance suggests that supply chain technology, when considered in isolation, may not directly translate into performance gains. This could imply that technology's impact on performance is more nuanced, possibly requiring complementary factors like operational capabilities or innovation to unlock its full potential. It points to the idea that technology alone may not be sufficient to drive performance improvements but could play a vital role when integrated into a broader strategic framework.

H3. Influence of Quality Management with Supply Chain Performance

Examines the effect of Quality Management on Supply Chain Performance, is supported with a standardized coefficient of 0.114, a T-statistic of 1.718, and a p-value of 0.043. This significance underscores that effective quality management practices, such as maintaining high standards, continuous monitoring, and consistent improvement processes, contribute positively to performance outcomes. This relationship suggests that quality management serves as a foundational element within the supply chain, directly enhancing the reliability and efficiency of operations, which subsequently drives performance improvements.

H4. Influence Supply Chain Operational Abilities on Supply Chain Performance mediated by Innovation Capabilities.

proposes that Supply Chain Operational Abilities enhance Innovation Capabilities, which in turn positively affect Supply Chain Performance. This hypothesis is supported, with a standardized coefficient of 0.065, a T-statistic of 3.933, and a p-value of 0.000, indicating a significant indirect effect. This finding highlights that operational capabilities play an important role in fostering innovation within the supply chain. By streamlining operations and enabling efficient resource allocation, these capabilities create an environment conducive to innovation, which then positively impacts overall performance. This underscores the indirect pathway through which operational strengths contribute to performance by nurturing a culture of innovation.

H5 Influence Supply Chain Technology on Supply Chain Performance mediated by Innovation Capabilities.

explores the indirect effect of Supply Chain Technology on Supply Chain Performance through Innovation Capabilities. Supported with a standardized coefficient of 0.156, a T-statistic of 5.135, and a p-value of 0.000, this finding suggests that while technology may not directly impact performance, it significantly enhances innovation, which subsequently leads to improved performance outcomes. This indicates that technology serves as a critical enabler of innovation within the supply chain, providing tools and systems that facilitate new processes, products, and efficiencies. In this indirect role, technology supports a culture of continuous improvement and adaptation, ultimately contributing to performance gains.

H6 Influence Quality Management on Supply Chain Performance mediated by Innovation Capabilities.

hypothesizes that Quality Management positively impacts Innovation Capabilities, which then enhances Supply Chain Performance. This hypothesis is supported, with a standardized coefficient of 0.157, a T-statistic of 4.636, and a p-value of 0.000. This significant relationship suggests that quality management practices not only contribute directly to performance (as seen in H3) but also foster an environment that encourages innovation. By ensuring high standards and systematic improvements, quality management establishes a stable and supportive foundation for innovative thinking and experimentation, which further benefits supply chain performance.

The hypotheses testing results demonstrate that Supply Chain Operational Abilities and Quality Management have both direct and indirect positive effects on Supply Chain Performance. Although Supply Chain Technology does not show a direct effect on performance, its impact is mediated through Innovation Capabilities, suggesting its role as a crucial enabler of innovation within the supply chain. These findings provide valuable insights into the pathways through which operational strengths, technology, and quality practices drive performance, emphasizing the need for an integrated approach to supply chain management that leverages both direct and indirect relationships to achieve optimal performance outcomes.

Table 4.15 Q^2predict

	Q^2predict
IC2	0.495
IC4	0.659
IC5	0.574
PSC1	0.518
PSC5	0.642
PSC6	0.622
PSC7	0.495

The Q^2 Predict values indicate that the model demonstrates moderate to high predictive relevance for specific indicators related to Innovation Capabilities and Supply Chain Performance. For Innovation Capabilities, indicators such as IC4 (Q^2 = 0.659) and IC5 (Q^2 = 0.574) show strong predictive relevance, suggesting that the model effectively captures and predicts changes within these areas, while IC2 (Q^2 = 0.495) indicates moderate predictive accuracy. In terms of Supply Chain Performance, indicators PSC5 (Q^2 = 0.642) and PSC6 (Q^2 = 0.622) exhibit high predictive values, highlighting the model's robustness in forecasting aspects tied to these performance measures. PSC1 ($Q^2 = 0.518$) also shows good predictive power, and PSC7 ($Q^2 = 0.495$) reflects moderate predictiveness. Overall, the model's strong predictive relevance for these key indicators underlines its reliability in anticipating variations in Innovation Capabilities and Supply Chain Performance, providing confidence that the model is a robust tool for strategic forecasting and decision-making in supply chain management.

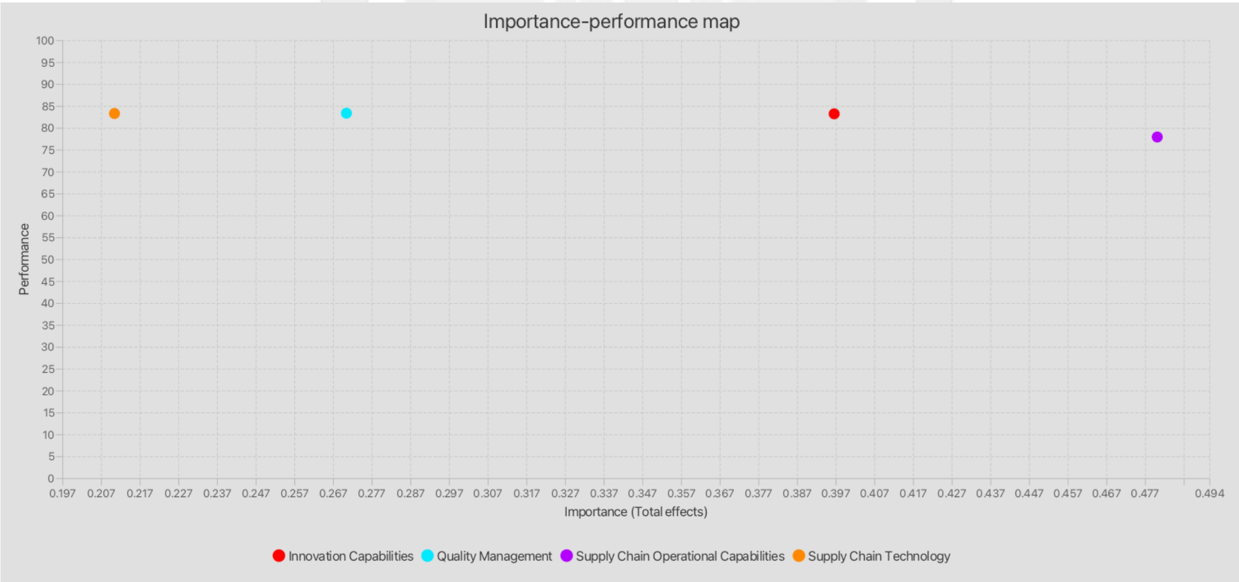

Fig 4.5 Importance-Performance Map Analysis (IPMA)

The Importance-Performance Map Analysis (IPMA) reveals key insights into which constructs most significantly impact Supply Chain Performance and where improvements could be most beneficial. Supply Chain Operational Capabilities and Innovation Capabilities are shown to have the highest importance in driving performance but are currently performing at a moderate level. This suggests that these areas present the greatest opportunities for improvement; by enhancing operational efficiency and innovation efforts, the organization could substantially boost its supply chain performance.

In contrast, Supply Chain Technology and Quality Management are performing well, with high performance scores, yet they have a relatively moderate importance in the overall model. This indicates that while these areas contribute positively, they are less critical to achieving major performance gains compared to operational and innovation capabilities. Therefore, prioritizing improvements in operational and innovation capabilities would likely yield the most significant impact on overall supply chain performance