Design for Supply Chain Performance Measurement in Fast-Food Restaurant Franchise

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Abstract

Performance measurement is the ability to understand current performance conditions, evaluate and create a continuous improvement. The performance measurement system needs to be designed from 3 different views which are company business process operations, industry characteristics, and the stakeholder view which have the authority in executive's decisions. In the study case, the fast-food restaurant franchise stands between 2 characteristics of industry. They are service and retail industry. The research objective is to design the performance measurement system based on the SCOR process model framework which could accommodate the characteristics of the company and the vision of the stakeholders. The researcher had selected metrics that are made of a comprehensive literature study and validated the suitable metric through the panelist. Later, the metrics will face Analytical Hierarchy Processing with the company's stakeholders to find the importance level of each metric. The result is the performance system designs with 5 metrics at process level, 13 attributes at the 2nd level, and 34 metrics at the 3rd level.

Keywords
Performance, Supply Chain, Fast Food, Restaurant Supply Chain, Performance System, Business Process.

1. Introduction

Local fast-food restaurants have been increasing recently in Indonesia. These restaurants combines local delicacies with a contemporary seasonings, or toppings to be served with a quick-serve manner to their customer. To promote their growth, they operate a franchise business model and establish several stores with the help of their partners. These create complexity in their supply chain system as companies need to serve each stores at the same level of quality. Ensuring each stores has sufficient material is one of the key operations to fulfill customer demand. However in the complex supply chain environment, several aspects needs to be considered to create balance between demand fulfillment and financial benefits. Therefore, many fast-food franchise could not sustain and close down in under 5 years. To be able to manage supply chain better establishing a performance measurement system is important for the company to be able to evaluate their performance (Vanany et al 2005; Leksono et al 2018).

Case study in this research took place in PT MRS, a family company who runs 14 fast-food restaurants across Indonesia. The company has central kitchen as their headquarter and distribution center in Surabaya to manage the material supplies for 10 stores in Java, 3 in Kalimantan, and 1 in Papua. They are projecting more store openings in 2022 as their brand grows and expect more customers to reach. PT MRS offers "Ayam Geprek" a fusion local dish combined with free rice refill for dine-in customers. PT MRS targets medium to low budget customer and took a small profit margin from the products sold. The central kitchen plays a critical role as the main controller of their supply

chain activities. It covers end to end activities from demand planning to raw materials sourcing. It also produces semi-finished goods such as premix seasonings, and flours mixture which are a strategic material and requires secrecy. The central kitchen is in charge in distributing these secret ingredients and also the raw materials which it buy from their suppliers to PT MRS store outlets across Indonesia.

With the complexity of supply chain arises as the number of the stores increase, PT MRS saw there was a need in improving their distribution activities. PT MRS decided to increase their visibility of their business process performance. PT MRS viewed that by increasing their visibility, they can enable continuous improvement in their organization. Therefore a performance measurement system is required in PT MRS industry. Supply Chain Operational Reference (SCOR) can be a reference to create supply chain performance system because the model is able to identify, evaluate and diagnose specific supply chain activities (Vanany et al 2005). However, there are not many research using SCOR for making performance measurement system in restaurant or service industry (Őzveri et al 2015). Therefore, the objective of this research is to design the performance measurement system using SCOR model which is suitable for PT MRS central kitchen operations.

2. Literature review

According to APICS (2017), Supply Chain Operational Reference (SCOR) is a model initiated by Supply Chain Council (SCC) in 1996. The SCC consisted of a number of multinational company such as Procter & Gamble who voluntarily shared their practical knowledge on manufacturing supply chain management. The model offers references on the method to diagnose, execute and do benchmarking to help organization improve their supply chain faster. It also offers references that can be applied in supply chain of every industries. This arguments have intrigued many researcher to explore more from the applicability of the model. Vanany et al (2005) argued that the breakdown of performance measurement to each particular activities is one of the advantage of using this model for performance measurement system. Knowing the exact root cause, help organization save resources more on the specific process that needs improvement.

SCOR suggests to review 6 different processes in every supply chain domain. They are Plan, Source, Make, Deliver, Return, and Enable. (APICS 2017). These processes should be analyzed at every nodes the supply chain has. For instance, if a supply chain has 3 domains which consists of supplier, producer, and retailer, the 6 processes have to be analyzed on each domain. Processes on each domain could be related to other processes in different domain. For instance, sourcing process on producer domain will likely related to deliver process in supplier. This enable the understanding of how processes related to other processes in entire supply chain. SCOR offers 3 layers of diagnostics to analyze the supply chain performance. First, is the process level, second is the attribute level, and third is the metrics level (APICS 2017). The attribute level serves as the diagnostics of the process level and the metrics serves as the diagnostics for the attribute level. According to APICS (2017) there are 5 attributes to be assessed in every process. They are Reliability, Responsiveness, Agility, Cost, and Asset Management.

According to Girjatovičs et al (2018), there are 4 things which need to be assessed to successfully implement SCOR model as the performance measurement system. First, is to fully understand the supply chain process. This is needed to make sure when SCOR model is adopted, there are no changes in mindset of supply chain flow and key processes. Second, company need to adapt the model. The reason behind this is because there are some references given are not complementary with the company's activities or key processes. It is needed that company can translate their activity terms, and add new references from SCOR to make the new performance measurement system. Third, it is important to verify to the experts. This is to make sure the architecture of the measurement system is appropriate for the company. Last thing that is very important is to enable the process. Besides the execution process, the enablement process make sure there are iterative actions to improve the system. It may not be perfect in the first place so the organization need to review and evaluate periodically to always align the system with the strategy.

Fast-food restaurant is a product of high mobilization in recent society. People do not expect high quality of food as a major factor in selecting the preferred restaurant (Kara 1995). In a research conducted to fast-food restaurants in America showed that service quality is a more dominant factor than food quality for customer satisfaction (Qin 2009). These arguments show that the characteristic of fast-food restaurant chain industry stand between retail industry and service industry. Cho et al (2012) synthesize a performance measurement system for service industry supply chain. It combines performance measurement attributes from SCOR model, the SERVQUAL attributes which are tangibles, reliability, responsiveness, assurance and empathy (Parasuraman et al 1998), and the six key attributes argued by Fitzgerald et al (1991) which are competitiveness, financial performance quality of services, flexibility, resource

utilization and innovation. Anand and Grover (2015) categorize metrics into 4 attributes to guideline key performance indicator in retail industry supply chain. They are transportation and logistics optimization, inventory and space optimization, information technology optimization and human resource optimization. Other retail performance measurement system was argued by Gawankar et al (2016) who shows 2 relational metrics which are supplier performance and partnership quality.

In a multi criteria decision making analytical hierarchy processing (AHP) is a pairwise comparison method that can be used. AHP ranks an alternative based on the suitability of the criteria made by the decision maker (Vanany et al, 2005). The advantage of using AHP method is the ability of the method to transfer decision maker knowledge into the consideration of several subjects to simultaneously give the feedback on synthesizing the conclusion (Saaty 1987).

3. Methods

PT MRS is the company case study adopted in this research. The research selected 3 panelists from PT MRS as subject matter expert to develop the supply chain performance system together. The panelists consist of 2 directors and 1 senior manager in outlet operations and supply chain. The main framework used in developing the system is SCOR where there are 5 main processes to be assessed. The research started by defining key processes and the key supply chain stakeholders of PT MRS. The next step was to incorporate the process defined to the SCOR framework. Specific metrics to measure the performance of each key activities defined was the next process on the research. They were summarized in a draft which need to be validated to the panelists. Metrics chosen were the metrics combined from metrics in SCOR and other references which were metrics for specific retail and service industry. Performance system draft metrics need to be validated. This was where panelists gave input on which metrics were not suitable for their industry. These metrics that were not suitable would be eliminated from the system. The remaining metrics, would be used to measure the supply chain performance. AHP was used to rank the metrics based on the importance to the supply chain of the company. AHP method would be used to rank until the panelists reach 0.1 of consistency ratio. The next phase was to give the scoring system on each metrics and tested the performance measurement system on the study case.

4. Results and Discussion

Each organization may have different terms on their supply chain system. Girjatovičs et al (2018) suggested to adapt the supply chain definition to SCOR model before adapting the model. Interviews and field assessments were conducted to understand the supply chain activities of the company. There were 3 key stakeholders identified in PT MRS supply chain. They were suppliers whom the company bought their raw materials from, central kitchen who was the main distribution center and semi-finished goods producer, and store outlets who served the end customer. Key activities of PT MRS were categorized according to 5 main processes of SCOR. Organizing the process to this format would be essential to structure the performance measurement system because metrics were bound to each key activities. Figure 1 shows the key activities existed in the case study.

Research on metrics which were suitable to measure the key process had been done based on the field assessment. The metrics chosen to measure these key activities were gathered from various research conducted in retail industry or service industry performance measurement. Metrics that were chosen, would be categorized based on the attribute of the metrics. Attributes were chosen based on the SCOR guidelines where there are 5 attributes to be assessed. They are reliability, responsiveness, agility, cost, and asset management. In-depth interview was conducted to validate whether the metrics and attributes were reflecting the supply chain performance. Those which were not reflecting the activities key points or not important to be measured were eliminated from the system. The elimination was done through the process of focus group discussion with the panelists. The result of the metrics which had been validated were mentioned in table 1. There were 34 metrics which have been validated with 1 metric measuring the plan process, 13 metrics measuring the source process, 10 metrics measuring make process, 8 metrics measuring delivery process and 2 metrics measuring the return process.

The hierarchy of the performance measurement is important for the managers to help diagnosed which metrics need to be improved. In table 1, the structure of the performance system defined each process with attributes and each attributes with metrics. This structures was introduced by SCOR to help managers diagnose specific process based on characteristics of the problem and because the metrics were bound to specific activities, managers should know what activities to improve. Each metric has to reflect the importance of the activities towards the overall supply chain performance. AHP method was introduced to weigh the importance of the each category in the hierarchy, from the

process level, attribute level to the metric level. Table 1 shows the importance weight of measurement on every level of hierarchy.

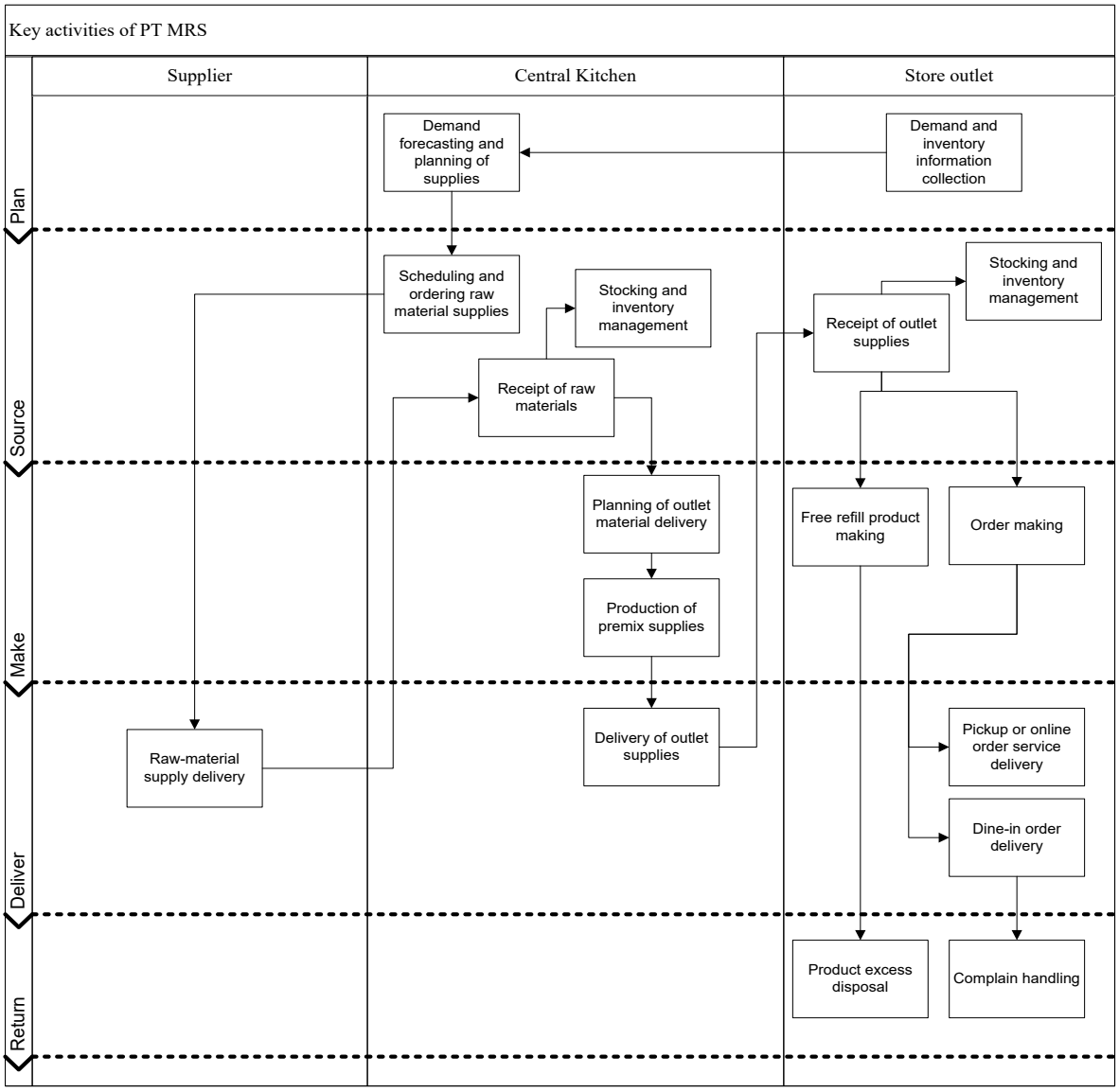

Figure 1 Key activities of the case study

At the process level, plan process was the most important process in the system with 39.50% weighting. This results was because in the fast-food industry, proper planning would determine the efficiencies of other processes such as inventory planning. The implication of a good plan process would minimize cost which was favorable by related industry who has minimum profit margin. At attributes level, it could also be inferred that whenever cost attribute was chosen, it would always has the highest weighting and followed by reliability at second place. The result showed that at fast-food industry, minimizing cost is the priority logic in measuring the performance of the company. Make process was the second most important process of the system. The results showed that product quality is the second priority of overall performance.

The hierarchy of the process were broken down to 3 layer to enable diagnostic ability. However, if the metrics were normalized to their attributes and process weightings, it could be seen which metric is the most dominant factor of the

performance system. The dominant metrics would be the main focus for fast-food restaurant managers to focus on improving. Figure 2 shows the pareto chart of top 5 metrics if they were normalized to their parent's attribute and processes. It could be seen that accuracy of forecast technique (PAFT) with 39.50% weight, was the most important metric for the system which resembled the demand processing activity in the supply chain. On the following metrics there were 2 metrics with 14.17% and 4.72% weighting of make cost which resembled the production of premix cost and order making cost. The fourth most important, was delivery cost which resembled the transportation cost of outlet materials from the *central kitchen*. The fifth was in the make of quality activity. With 3.91% of normalized weighting, it resembled the order making activity in each outlet. Those 5 metrics, were the most important metrics which fast – food restaurant managers had to maintain as it had already covered 66.43% of the overall supply chain performance.

Table 1. Metrics for PT MRS supply chain performance measurement system

Processes	Attributes	Metrics	References
Plan (P) - 39,50%	Reliability (PRe) - 100%	Accuracy of forecast technique (PAFT) – 100%	(APICS 2017), (Kusrini et al 2019), (Vanany et al 2005), (Cho et al 2012), (Őzveri et al 2015)
Source (S) – 16.9%	Reliability (SRe) – 62.5%	Buyer - Supplier Partnership level (SSPL) – 8.10%	(Cho et al 2012),(Őzveri et al 2015)
		Orders Delivered in full -Raw material (SODIFRM) – 17.40%	(APICS 2017), (Kusrini et al 2019),
		Order without transaction error - Raw material (SDARM) – 4.10%	(APICS 2017), (Kusrini et al 2019),
		Perfect Condition -Raw material (SPCRM) – 35.10%	(APICS 2017), (Kusrini et al 2019),
		Orders Delivered in full -outlet material (SODIFOM) – 8.80%	(APICS 2017), (Kusrini et al 2019)
		Order without transaction error - Outlet material (SDAOM) – 2.90%	(APICS 2017), (Kusrini et al 2019)
		Perfect Condition - Outlet material (SPCOM) – 23.60%	(APICS 2017), (Kusrini et al 2019)
	Responsiveness (SRs) – 23.8%	Source Cycle Time - Raw Material (SCTRM) – 75%	(APICS 2017), (Kusrini et al 2019)
		Source Cycle Time - Outlet (SCTOM) – 25%	(APICS 2017), (Kusrini et al 2019)
	Asset Management (SAM) – 13.7%	Inventory days of supply - Raw Material (SIDOSRM) – 16%	(APICS 2017), (Harwati 2019)
		Inventory days of supply - Outlet Material (SIDOSOM) – 46.70%	(APICS 2017), (Harwati 2019)
		Inventory defect – Raw Material (SIDRM) – 9,50%	(APICS 2017), (Kusrini et al 2019)
		Inventory defect – Raw Material (SIDOM) – 27.70%	(APICS 2017), (Kusrini et al 2019)
Make (M) – 32.50%	Reliability (MRe) – 25%	Schedule Achievement (MSA) – 28.80%	(APICS 2017), (Harwati 2019)
		Product Yield – Premix (MPYPX) – 15.40%	(APICS 2017), (Kusrini et al 2019), (Vanany et al 2002)
		Product Yield - Product refill (MPYPR) – 8.10%	(APICS 2017), (Kusrini et al 2019), (Vanany et al 2002)
		Product quality customer complain (MQCC) – 47.70%	original
	Responsiveness (MRs) – 11.10%	Make Cycle Time –Premix (MCTPX) – 14.30%	(APICS 2017), (Kusrini et al 2019), (Vanany et al 2002)
		Make Cycle Time -Product Refill (MCTPR) – 28.60%	(APICS 2017), (Kusrini et al 2019), (Vanany et al 2002)
		Make Cycle Time – Order (MCTPO) – 57.10%	(APICS 2017), (Kusrini et al 2019), (Vanany et al 2002)
	Cost (MC) – 57.5%	Cost to make – Premix (MCTPX) – 75%	(APICS 2017)

		Cost to make – order (MCTPO) – 25%	(APICS 2017)
	Asset Management (MAM) – 6.3%	Service Productivity (MSP) – 100%	(Cho et al 2012), (Özveri et al 2015)
Deliver (D) – 6.6%	Reliability (DRe) – 13.7%	Delivery Performance to commit date (Raw Material – central kitchen) (DPCDRM) – 17.6%	(APICS 2017), (Kusrini et al 2019),
		Delivery Performance to commit date (Raw Material – outlet) (DPCDOM) – 29.7%	(APICS 2017), (Kusrini et al 2019),
		Orders Delivered in full (DODIF) – 8.2%	(APICS 2017), (Kusrini et al 2019),
		Perfect Condition (DPC) – 44.5%	(APICS 2017), (Kusrini et al 2019),
	Responsiveness (DRs) – 23.8%	Delivery Cycle Time - Premix (DPCTPX) – 16.3%	(APICS 2017), (Kusrini et al 2019), (Vanany et al 2002)
		Service Delivery Query Time – Online (DSDQTO) – 29.7%	(Cho et al 2012), (Özveri et al 2015)
		Service Delivery Query Time - Dine in (DSDQTD) – 54%	(Cho et al, 2012), (Özveri et al, 2015)
	Cost (DC) –62.5%	Cost to Deliver (DCO) – 100%	(APICS, 2017), (Kusrini et al, 2019),
Return (R) – 4.2%	Responsiveness (RRs) – 75%	Customer complaint to product replacement cycle time (RCRCT) – 100%	(Cho et al, 2012),
	Asset management (AM) – 25%	Product Excess Wasted (RCPW) – 100%	Original

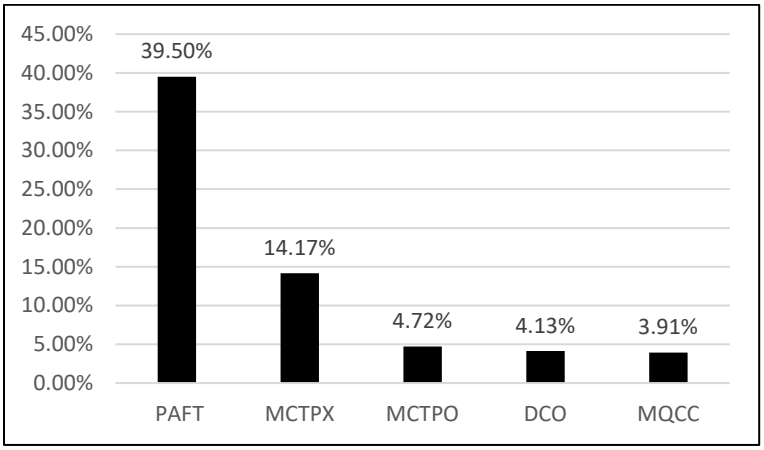

Figure 2 Top 5 metrics weight normalized to their parents weighting

The performance measurement system design was tested to view the company performance in 2021. Scoring system was used based on the recommendation given by Soleh et al (2005). The scoring system would give the actual performance view whether the number measured should be increased, decreased, or maintain in specific number. It was identified there were 13 metrics with higher the better (HtB) scoring system, 18 metrics with lower the better (LtB) scoring system, and 3 metrics with precise is better scoring system (PtB). For testing purposes, target was an arbitrary number discussed in a FGD forum based on the ideal number given by the panelists. The traffic light system divided achievement to green, yellow and red level. The green achievement showed metrics which had achieved above 90% of the target. Yellow achievement showed metrics which had achieved 70% to 90% of the target. Whereas red colored achievement showed metrics with has below 70% of achievement which have to be improved.

The result of PT MRS performance measurement can be seen in table 2. There were 4 metrics with red achievement in 2021. These were the metrics which managers should focus on improving the performance of PT MRS. Managers

should prioritize which metric should be improved first out of those 4 metrics. Ranking the prioritization out of this 4 could be done by measuring the impact to the overall supply chain performance. Normalizing the results with the attribute weight and process weight was the method to measure the impact. The result showed that managers should prioritize on improving MQCC first as the most impactful reduction to overall performance. The prioritization should then be followed by MSP, RCPW, SIDOSRM.

Table 2 Performance measurement of PT MRS

Process	Att. code	Metric code	Metric weight	Target	Actual	Units	Scoring system	Achievement	Process weight	Att. weight	Metric score	Att. score	Process score
Plan	PRe	PAFT	100%	70	65.8	%	HtB	94%	39.50%	100%	0.94	0.94	0.371
Source	SRe	SSPL	8,10%	3,5	4.0	#	HtB	114%	16.90%	62.50%	0.09	0.64	0.170
		SODIFRM	17,40%	95	97.7	%	HtB	103%			0.18		
		SDARM	4,10%	95	99.1	%	HtB	104%			0.04		
		SPCRM	35,10%	90	88.9	%	HtB	99%			0.35		
		SODIFOM	8,80%	95	98.9	%	HtB	104%			0.09		
		SDAOM	2,90%	98	99.8	%	HtB	102%			0.03		
		SPCOM	23,60%	90	93.4	%	HtB	104%			0.24		
	SRs	SCTRM	75%	1	0.9	Days	LtB	109%		23.80%	0.82	0.24	
		SCTOM	25%	2	2.8	Days	LtB	71%			0.18		
	SAM	SIDOSRM	16%	4	7.0	Days	PtB	25%		13.70%	0.04	0.13	
		SIDOSOM	46,70%	4	3.6	Days	PtB	90%			0.42		
		SIDRM	9,50%	3	2.3	%	LtB	130%			0.12		
		SIDOM	27,70%	2	1.6	%	LtB	125%			0.35		
Make	MRe	MSA	28,80%	100	100.0	%	PtB	100%	32.80%	25%	0.29	0.20	0.305
		MPYPX	15,40%	91	85.8	%	HtB	94%			0.15		
		MPYPR	8,10%	47	52.4	%	HtB	111%			0.09		
		MQCC	47,70%	20	33.0	#	LtB	61%			0.29		
	MRs	MCTPX	14,30%	30	28.9	Min.	LtB	104%		11%	0.15	0.11	
		MCTPR	28,60%	90	96.0	Min.	LtB	94%			0.27		
		MCTPO	57,10%	12	12.2	Min.	LtB	98%			0.5		
	MC	MCTPX	75%	410	418.9	M-IDR	LtB	98%		57.60%	0.73	0.58	
		MCTPO	25%	339	319.8	M-IDR	LtB	106%			0.27		
	MAM	MSP	100%	0,14	0.2	M-Emp/sales	LtB	70%		6.40%	0.70	0.04	
Deliver	DRe	DPCDRM	17,60%	98	99.3	%	HtB	101%	6.60%	13.70%	0.18	0.14	0.068
		DPCDOM	29,70%	98	99.6	%	HtB	102%			0.30		
		DODIF	8,20%	95	96.7	%	HtB	102%			0.08		
		DPC	44,50%	95	100.0	%	HtB	105%			0.47		
	DRs	DPCTPX	16,30%	3	2.8	Days	LtB	107%		23.80%	0.17	0.25	
		DSDQTO	29,70%	15	16.7	Min.	LtB	90%			0.27		
		DSDQTD	54%	15	13.6	Min.	LtB	110%			0.60		
	DC	DCO	100%	15	14.6	M-IDR	LtB	103%		62.50%	1.03	0.64	
Return	RRs	RCRCT	100%	10	11.4	Min.	LtB	88%	4.20%	75%	0.88	0.66	0.035
	RAM	RCPW	100%	3	4.5	Kgs	LtB	67%		25%	0.67	0.17	
Overall performance										**94,9%**			

5. Conclusions

Design for fast food restaurant supply chain performance measurement system had been made using SCOR framework. The framework had the ability to diagnose based to activity level of detail. The designed performance system consisted of 5 metrics in the process level, 13 metrics in the attribute level, and 34 metrics in the metric level. The most important process which could be inferred from the design was plan process with 39.50% of weight. The most important metrics could only be determined after normalizing the metrics to the process level. The most important metric was Accuracy of forecast technique (PAFT) with 39.50% therefore the activity related to this metric plays significant role to the overall performance of supply chain. The designed system had been tested to PT MRS and showed 4 red level metrics in the traffic light system. It is suggested to the company to prioritize on improving the red level metrics.

The supply chain performance system had been designed to measure specific to supply chain activity in a company. If company want to use the design for their performance measurement system, it was suggested to adjust the metrics based on the key activities in the company environment and not to fully copy the design. It was suggested for companies using the design for their supply chain measurement system to evaluate the system periodically. Because, over the time the key activities might be different. Practical implications of this research were the proposed design for

SC performance measurement system that had been made not only applicable to fast-food restaurant franchise companies but also restaurant and food companies. Food safety including the ability of traceability systems (Vanany et al 2016; Gunawan et al 2019) and food risks (Vanany and Zailani 2010) were important issues in food companies. In the future, what food safety indicators needed to be in a performance measurement system was a research agenda that needs to be investigated. Researcher who wanted to enhance the research further, it was suggested to use multiple study cases so that it could extract more objective view to the industry assessed.

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