Supply Chains Operating Performance - A Financial Approach To Measurement

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ABOUT THE AUTHOR

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I am the owner of Learn About Logistics www.learnaboutlogistics.com, the specialist online learning provider of practical learning in logistics, supply chains and supply networks. My background as a practitioner, consultant and educator uniquely qualifies me to provide this service.

At RMIT University in Melbourne, Australia I developed and presented the largest supply chain post-graduate program in the Asia Pacific region; the program was presented at centres in Melbourne, Singapore and Hong Kong. While at the University I was appointed as the Ford Motor Company Procurement Fellow for a period of two years. I was later engaged as the Deputy Director of the Institute for Logistics and Supply Chain Management at Victoria University in Melbourne.

My extensive consulting background includes significant high-level roles. As an Associate Director at a global consulting firm, I led teams that assisted clients to improve their logistics operations, strategic procurement and associated IT systems.

Earlier, at a multinational computer company I provided analysis of IT requirements for manufacturing industry customers and project management for implementing ERP/MRP software applications.

My industrial management experience covered industrial engineering, management accounting, purchasing and operations in the shipping, chemical, metals and food industries.

I hold a Master degree in Logistics Management and a first class honours degree in Finance and Accounting. I am certified in Production and Inventory Management (CPIM) and a Certified Purchasing Manager (C.P.M). I am also certified in Assessment and Workplace Training.

I co-authored the book, published by McGraw-Hill in 2011, titled A Framework for Supply Chains – Logistics Operations with an Asia Pacific Perspective (in Australia and New Zealand it is titled A Framework for Supply Chains – Logistics Operations in the Asia Pacific Region). In 2007, I co-authored the book Working Capital: Business Success and Profitability. I was a contributing author for the books Dynamic Supply Chain Alignment – a new business model for peak performance in enterprise supply chains across all geographies (John Gatorna Ed. 2009) and Supply Chain Management – a Procurement Perspective (Pieter Nagel Ed. 2003). I have written articles for the business press and presented papers at conferences in Australia, Asia and Europe.

I am a past president of APICSau, the society for supply chain professionals in Australia.

OBJECTIVE OF THE STUDY

To provide structured statements that measure the financial value and performance of the operational Core Supply Chains. This removes reduction of costs as the main measure of success in Supply Chain functions.

FINANCIAL PERFORMANCE MEASURED IN LEVELS

Corporate level

The main financial statements prepared for a Board of Directors and CEO of a shipper or brand organisation are the Balance Sheet, Income (Profit & Loss) and Cash Flow.

The statements are structured to report historical financial information. They are used by external stakeholders, the organisation's senior management and finance executives. Corporate financial statements are not designed to provide an understanding of operational activities and performance within an organisation's Supply Chains.

Level 1

The research firm Supply Chain Insights at http://supplychaininsights.com/ provides an analysis of Supply Chain Metrics for listed American public companies, using published financial reports. The four metrics are Growth, Operating Margin, Inventory Turns and Return on Invested Capital (ROIC)). Supply Chain Insights states:

> *"…this ranking system is based solely on quantitative data and corporate financial performance, removing subjectivity from the decision process. Performance of financial supply chain metrics is compared with stock market performance (market capitalization) to identify top performers. In addition, the Index is built upon peer groups operating in the same industries, with similar challenges and opportunities present within the business environment".*

This approach, called the 'Level 1' Supply Chains - Corporate financial statements, could be adopted in any country by businesses that wish to evaluate the financial performance of their core Supply Chains, using Corporate financial statements. However, as Supply Chain Insights observes "there is no commonly held definition of supply chain excellence".

Both the 'Corporate' financial statements and the 'Level 1' analysis approach by Supply Chain Insights provide measures of performance for senior management and external communities.

Level 2

The next level of financial metrics, called ‘Level 2’ Supply Chains - Operations, is required to support the management of an organisation’s Core Supply Chains. It contains four statements:

1. Supply Chains Working Capital
2. Cash to Cash cycle time
3. Supply Chains Value Added (VA)
4. Supply Chains Return on Invested Capital (SC-ROIC)

Comparing financial statements at the three levels

Level	Cash	Assets	Income
Corporate	Cash Flow	Balance Sheet	Income (P&L) statement
Level 1 Supply Chains - Corporate		Return on Invested Capital (ROIC)	Growth
		Inventory turns	Operating margin
Level 2 Supply Chains - Operations	Supply Chains Working Capital	Supply Chains ROIC	Supply Chains Value Added
	Cash to Cash cycle time		

Table 1: Comparing financial statements at the three levels

SUPPLY CHAINS OF AN ORGANISATION

The Supply Chains of an organisation comprise items, money, transactions and information that commence at mines and farms, flow through a network of suppliers, move through the organisation and out to customers and their customers.

The immediate suppliers and customers of an organisation are called Tier 1. Suppliers obtain their supplies from Tier 2 suppliers. Likewise, Tier 1 customers may supply to Tier 2 customers and so on. A Supply Chain has two parts - Core and Extended:

1. **Core Supply Chains:** from Tier 1 suppliers through the organisation to Tier 1 customers. It comprises the flows of items, money, transactions and information handled by the Supply Chain Group. This comprises responsibilities for Procurement, Operations planning and Logistics
2. **Extended Supply Chains**: the flows of items, money, transactions and information from Tier 2 suppliers and customers to Tier 3 and beyond

Core Supply Chains

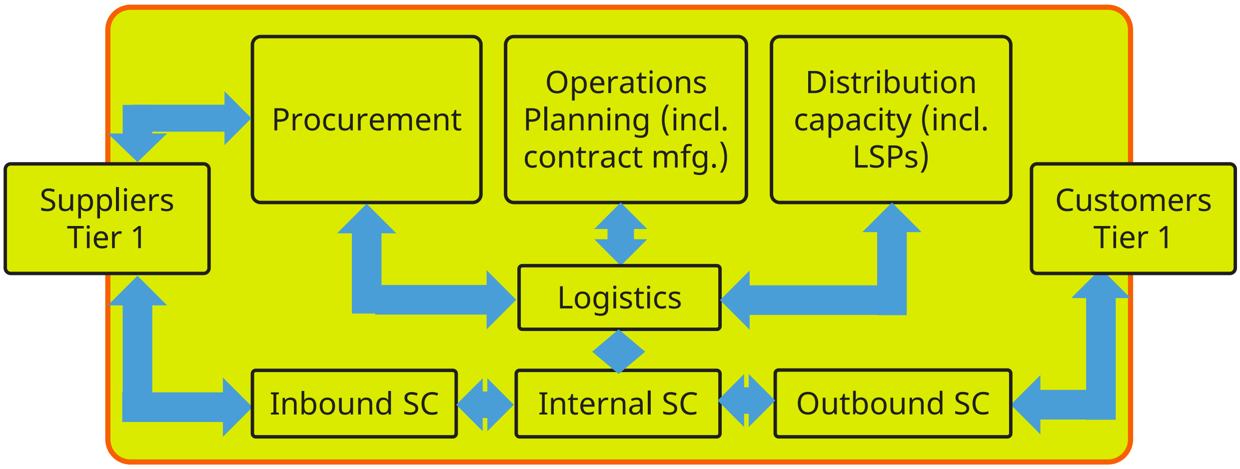

Figure 1 Supply Chains – the Core

The Core Supply Chains can be measured and performance evaluated. The Extended Supply Chains must be analysed to understand their structure, use of power and risks that exists and the range of responses available to the organisation.

CORE SUPPLY CHAINS (LEVEL 2) FINANCIAL STATEMENTS

To gain acceptance by financial executives, boards of directors and senior management, the Level 2 metrics must utilise the base data collected for the corporate financial statements. Some reformatting is required so that data is relevant for reviewing and improving the performance of Core Supply Chains; however, the principles supporting the corporate financial statements remain.

An organisation's Core Supply Chains will use four financial statements:
1. Supply Chains Working Capital
2. Cash to Cash cycle time
3. Supply Chains Value Added (VA)
4. Supply Chains Return on Invested Capital (SC-ROIC)

1. Supply Chains Working Capital

The lifeblood of an organisation is cash - while profits increase shareholder wealth, cash provides for an ongoing business. Therefore, financial viability for an organisation requires the management of Working Capital.

Supply Chains Working Capital is a measure of time, which is an operational measure:
- The longer a process takes, the more money is consumed by the organisation
- Items must be received and supplied in the most effective timeframe to maintain and potentially improve an organisation's profit margins

Working Capital at the corporate level is structured as:
current assets less current liabilities (that is: cash + inventory + accounts receivable – accounts payable)

Activities of the Supply Chains Group support business relationships with suppliers and customers and have a direct role in the timely collection and payment of cash. The financial performance measures for Supply Chains should therefore reflect this objective, together with responsibility for the quantity of Working Capital required by the enterprise.

Responsibility for Working Capital allows the Supply Chain Group to make a range of decisions and improvements that meet the objective of Logistics. This objective is *'to satisfy customer needs by providing availability of goods and services, through the time-related positioning of internal and external resources, at the lowest total cost'.*

Challenge of Corporate Working Capital statement

The corporate Cash Flow metric encourages organisations to delay payment to suppliers, because doing so improves the corporate Working Capital position. But, using suppliers' funds to even partially finance an organisation is damaging to the overall success of its Supply Chains.

The outcome can be that Tier 1 suppliers may be unable to fund extended credit terms that are forced upon them, so they extend payment terms to their suppliers, who are even less able to fund the revised terms. Smaller suppliers may have to pay suppliers of critical materials on terms of net 7 days or even 'cash on delivery'! The imbalance of payment terms can result in bankruptcies of suppliers through a supply chain and cause follow-on problems for their customers; especially those in 'just in time' (JIT) situations, such as automotive and electronics assembly.

Areas to address in organisations that delay payment to suppliers

Working Capital performance is not just a finance challenge; poor results are a symptom of failings in operational business processes. Table 2 lists some of the symptoms to be addressed.

Working Capital Element	Supply Chain Factors Affecting Working Capital
Inventory	Inventory management (policy, planning and control) ▪ Relationship with suppliers ▪ Sourcing strategies ▪ Sourcing lead times ▪ Order cycle time ▪ Forecast methods ▪ Delivery lead time ▪ Inventory location + form and function ▪ Inventory shrinkage costs ▪ Slow and Obsolescent (SLOB) inventory valuation
Accounts Receivable	Collection of money from customers ▪ Credit management and invoice dispute resolution processes ▪ Invoice accuracy ▪ Invoice terms ▪ Credit check process = non- shipment of goods ▪ Letter of credit clauses ▪ Delivery windows by customers
Account Payable	More efficient processes with suppliers ▪ Terms & conditions (T&C) in contracts ▪ Discounts taken for early payment ▪ Late payment due to process failure

Table 2: Areas to address in organisations that delay payment to suppliers

Key elements of managing Working Capital

- Segmentation and analysis of customers (the 'Cost to Serve')
- Segmentation and analysis of suppliers and inventory
- Implementing Sales & Operations Planning (S&OP) and
- IT applications to assist in tracking, consolidation and measurement of Working Capital

Supply Chains Working Capital structure

A more accurate representation of Working Capital requires two changes to the Corporate statement:

1. Accounts Payable is added to Accounts Receivable, not subtracted. When an order is placed with a supplier, it established an obligation to pay – that is cash out. Allocating cash to suppliers (through raising purchase orders) means that cash should not be available for ongoing operations.
2. Recognise the cost of holding inventory. This is not a line item in the Corporate Income Statement, nor the Corporate Working Capital statement. However, to present a realistic picture within the Supply Chains Working Capital statement, the Inventory Holding Cost is incorporated as a nominal charge.

Cost to hold inventory

The cost to hold inventory uses one of three approaches to calculate the cost of inventory:

1. The cost for the organisation to borrow money
2. The organisation's 'weighted average cost of capital', which is the after tax cost of debt and equity for the organisation
3. Calculated inventory carrying costs as shown in Table 3

Inventory Carrying Costs

Cast Category	Expenditure
Capital	Cost to borrow money to purchase items
	Inventory financing – opportunity cost
Servicing	Inventory insurance premiums
	Government (central, state/province, local) taxes and charges
	Administration
	Out of stock replenishment costs
Storage space	Company owned, rented and public
Inventory risk	Obsolescence of items held in inventory
	Damage to inventory
	Shrinkage of inventory value through theft
	Reduction in inventory value through age e.g. use-by date
	Reduction in inventory value through reduced potency i.e. chemicals

Table 3: Inventory carrying costs parameters

Calculate each line item within a category as a percentage of the Cost of Goods Sold (COGS), located in the Corporate Income (P&L) statement. The total cost of holding inventory will be between 20 and 30 percent, depending on the industry and the cost of borrowing money.

The revised Working Capital statement is therefore:
*cash + inventory value + cost of holding inventory (inventory value * inventory holding costs) + accounts receivable + accounts payable*

2. Cash to Cash cycle time

The Cash to Cash cycle time (also called the cash conversion cycle (CCC)) is the Working Capital performance measure. The CCC determines the days of cash required to fund ongoing operations - investment in inventory and providing credit to customers against the payments made for purchases.

Table 4 is an example of the time taken for cash invested as inputs to flow back into the organisation. Due to differences in how each industry operates, organisations will have different cash to cash cycle outcomes.

Cash to Cash Cycle example calculation

	Month Commencing	Month Ending
Balance sheet		
Accounts receivable	$30m	$29m
Inventory at cost	$7m	$6m
Accounts payable	$14m	$13m
Profit & Loss statement		
Sales		$20m
Cost of Goods Sold (COGS)		$14m
Gross profit		$6m
Cash to Cash days		
Inventory days of supply	($7m + $6m)/2) / ($14m/30days)	13.93
Days receivable outstanding (+)	($30m + $29m)/2) / ($20m/30 days)	44.25
Days payable outstanding (-)	($14m + $13m)/2) / ($14m/30 days)	28.93
Cash to Cash cycle days		**29.25**

Table 4: An example Cash to Cash Cycle calculation

Like most performance measures used in Supply Chains, CCC results should not be viewed in isolation; instead consider the trend. Measure and plot the standard deviation to know whether the variable results are ‘in control’.

3. Supply Chains Value Added (VA) Statement

This statement has similarities to the Corporate Income (P&L) statement; it reflect the money spent with suppliers and the Value Added to purchases by the organisation.

Income statement and Supply Chains Value Added statement compared

Corporate Income P & L Statement	%	Supply Chain VA Statement	%
		Volume Related	
Sales Revenue	100.0	Sales Revenue	100.0
Cost of Goods Sold	68.8	Supply Market Spend	51.4
Gross Profit	31.2	Value Added	48.6
		Time Related	
Operating Expenses	10.0	Employee Share (equal to 50% of 48.6)	24.3
		Organisation Share	3.1
Operating Profit	21.2	Operating Profit (EBITDA)	21.2
Tax / Interest	15.9	Finance Share	15.9
Net Profit	5.3		
Shareholders Dividend	3.0	Shareholders Share	3.0
Retained Earnings	2.3	Retained Earnings	2.3

Table 5: Value of Supply Chains to an organisation

The Corporate Income (P&L) statement has all supply related expenditure grouped under the general heading of 'Cost of Goods Sold' (COGS). For retail and wholesale businesses this is called Cost of Sales, as purchases are generally for goods ready for resale.

Supply Markets spend

The COGS measurement does not indicate how the expenditure is used. For example: in a manufacturing organisation, which payments have been made for purchased materials, components and products; or payments for service contracts, such as logistics service providers (LSPs)? In the *Supply Chains VA* statement, the expenditures in supply markets (the Supply Markets Spend) are traced and consolidated by supplier.

Value Added

The Supply Chains Value Added (VA) is volume related and calculated by deducting the Supply Markets Spend from the net Sales revenue (revenue after paying royalties, commissions and allowing for bad debts). The VA is available to pay time related costs of the organisation – employee, organisation, finance and shareholder.

Employee share

In the *Supply Chains VA* statement, the 'Employee share' is the total people costs of the organisation (the 50 percent of VA in the Table is for illustration); it incorporates the total cost of employing all paid staff (including senior executives). Included in the 'Employee Share' are: salaries and wages, annual leave, superannuation payments and employee benefits. Examples of benefits are: company supplied cars, baby crèche, staff dining or meals subsidy and training.

The people costs figure can be further broken down to the costs within each function, department or group. This includes the Supply Chain Group, comprising Procurement, Operations Planning and Logistics responsibilities.

Organisation share

In the *Supply Chains VA* statement, the 'Organisation Share' comprises the costs incurred to legally establish and maintain the organisation, such as registrations, licences, professional audit fees etc.

Final measurements

In the *Supply Chains VA* statement, the figure remaining after deduction of the 'Employee Share' and 'Organisation Share' is the 'Earnings before Interest, Tax, Depreciation and Amortisation', or EBITDA.

In both the Corporate Income statement and Supply Chains VA statement, the following remain the same: Tax/Interest or Finance share; Shareholders dividend or Shareholders share and Retained Earnings.

Summary

The *Supply Chains VA* statements contain no estimates or calculations - all costs are directly allocated. Purchases are allocated to 'Supply Markets Spend' by supplier; employee costs are identified within the 'Employee Share' under each functional group and 'Organisation Share' expenses can be extracted.

4. Supply Chains Return on Invested Capital (SC-ROIC)

The Strategic Profit Model (also called the DuPont chart) provides a structure at the Corporate level for the calculation of Return on Investment (ROI); Return on Assets (ROA) and Return on Equity (ROE).

Figure 2 illustrates the Supply Chains Return on Invested Capital (SC-ROIC), incorporating the measures of Supply Chains Working Capital and EBITDA. As with other Supply Chain financial measures, the absolute ROIC value at a point in time is less important than the trend.

Strategic Profit Model structure for the SC-ROIC metric

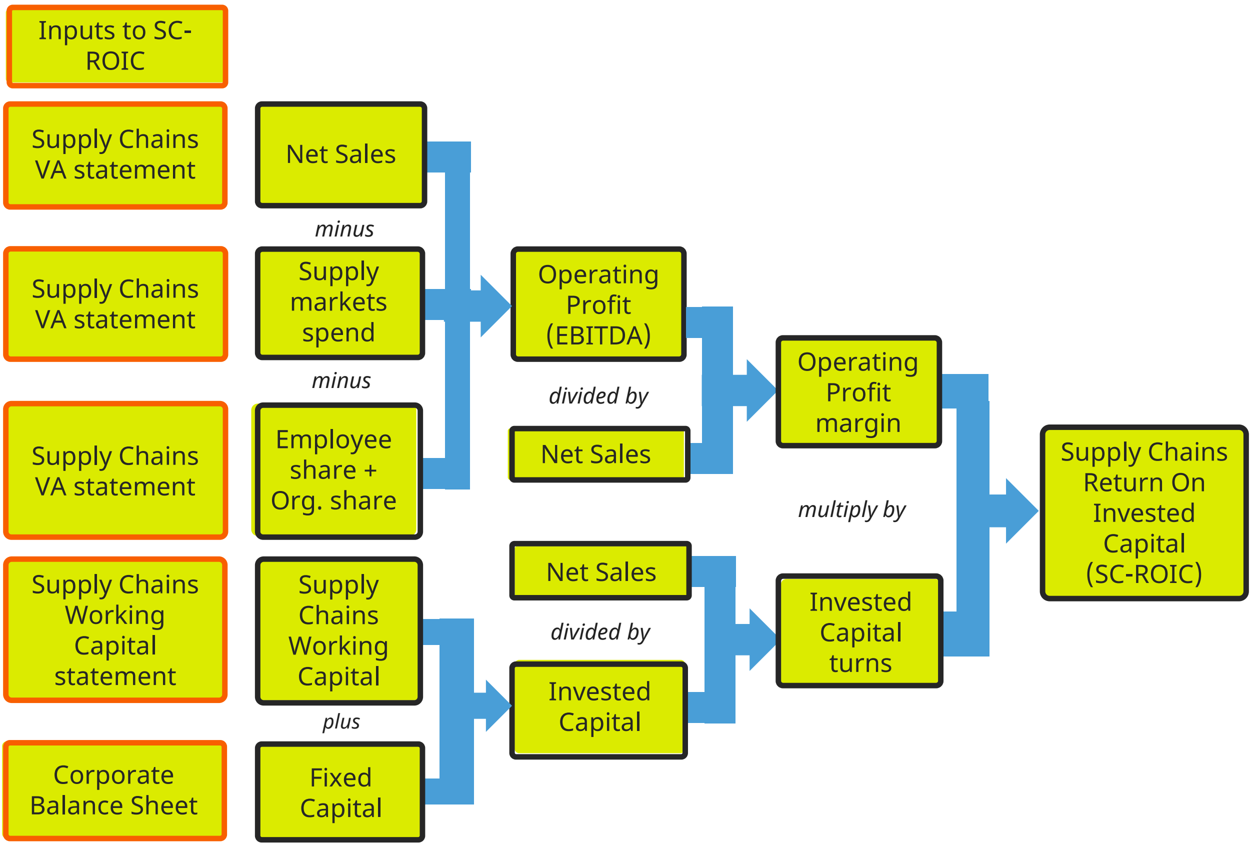

Figure 2: Supply Chain Return on Invested Capital (SC-ROIC)

SUPPLY CHAINS AS AN INVESTMENT

Value of the Supply Chain Group

The *Supply Chains VA* statement assists in building the perception of Supply Chains as an investment in supplier and customer relationships. The total monies spent by the Supply Chain Group are:

- Employment of the Supply Chain Group people (from the 'Employee Share')

Plus the

- 'Supply Markets Spend' on goods and services

The total cost is also shown as a percentage of Net Sales.

Using the *Supply Chains VA* statement within the organisation has benefits:

- The ratio of VA per full time equivalent employee
    - This metric can be used as an overall performance measure for the organisation. It provides an ongoing (trend) measure to identify the capability of all employees in the organisation to generate VA.
- Demonstrate the outcomes from changes to the VA 'cake'. For example
    - As employees wish to increase their share of VA, positive discussions can be held concerning the actions required. Examples are:
        - An increase in the VA (through increases in sales or prices)
        - A reduction in the total cost of ownership (TCO) for goods and services; achieved through reduced: total people costs, company costs, finance costs or the shareholder's share

Elements within the *Supply Chains VA statement* indicate where reductions in the TCO can be achieved:

- Sales:
    - Management of incoming orders
    - Customer service levels
    - Calculating the probability of 'perfect order' (that is: delivery in full, on time, with accuracy or DIFOTA)
    - Actual order fill rate and order cycle time (DIFOT)
    - Cost to Serve (CTS) calculations and decisions
    - Improved co-ordination of promotions
- Supply markets spend:
    - Process improvements
    - Storage and transport costs
    - Bill of Materials (BOM) accuracy
    - Outsourcing policy
- Employee share:
    - Planning and scheduling capability e.g. poor planning leads to excessive overtime payments

CHALLENGES TO SUCCESSFUL IMPLEMENTATION

The challenges for implementing Core Supply Chains (Level 2) financial measures are in three main areas:

1. Acceptance and support of accountants
2. Acceptance by senior management
3. Implementing changes to ERP and other IT applications by internal IT and software suppliers.

Supply Market Spend application

The chart of accounts means that the structure of the general ledger, cost centre and other codes are created to facilitate Accounting procedures. However, to assist Procurement with their knowledge and capability to work with suppliers, there is a requirement for Spend Analysis software. This requires an Application that is:

- Capable of operating across multiple systems (head office and subsidiaries/divisions) to gather accounting transactions and reformat them to enable ‘spend analysis’
- The reformatting is required to consolidate the total spend within each supplier entity, which takes account of the following situations:
    - Suppliers can trade under multiple divisions and businesses
    - The supplier’s name can be entered differently in the buying organisation’s accounts payable files
    - Multiple general ledger and cost centre names
    - Categories and standard industry (SIC) codes may be used in one part of the organisation, but not others
    - Descriptions of the product or service can vary, depending on the user’s understanding

Overcoming the challenges

A successful implementation of the Level 2 Supply Chain financial statements requires Supply Chain professionals that have a capability to ‘sell’ the new concepts to senior management and the Finance and Accounting functions. This requires the Supply Chain professionals to have a reasonable understanding of and be comfortable when discussing finance and accounting principles and implementation.

USE THE CONCEPT

This study outlines an approach for measuring the financial performance of Core Supply Chains. The proposal can be used by organisations and within learning institutions as a starting point for change and improvement to the measurement of performance for Core Supply Chains.

Use the Level 2 measurements in conjunction with Corporate financial statements and the Level 1 Supply Chain measures developed by Supply Chain Insights. The three levels of financial statements will provide a comprehensive picture for management of an organisation and its Supply Chains.

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