Why and how to employ the SIPOC model

Charlie Brown

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Primary Residential Mortgage, Inc., NMLS# 3094, 1480 North 2200 West, Salt Lake City, UT 84116, USA
Tel: +1 800 255 2792 x1000120; E-mail: cbrown@primeres.com

Charlie Brown

Charlie Brown *is Director of Enterprise Risk Management for Primary Residential Mortgage, Inc., where he is responsible for life safety, emergency response and business continuity. He also chairs the company's Risk Oversight Committee and co-chairs the Information Security Committee. He has Associate Risk Management Professional certification from the Disaster Recovery Institute International and instructor certifications from the American Red Cross and Federal Emergency Management Agency. He sits on the advisory board of Utah's Be Ready Business Private Sector Preparedness Council and is a director of sponsorships for the Northern Utah Chapter of the Project Management Institute. He is also a member of the Utah Emergency Managers Association and received the Private Sector Volunteer Award for 2017.*

Abstract

Within the business continuity industry, the debate regarding the business impact analysis (BIA) shows no sign of being resolved. Fervent discussions online, at conferences and in businesses around the world continue to promote or dispute its value. This paper does not pretend to resolve that debate but offers a compelling alternative to achieve the outcomes entrusted to the BIA and overcome the challenges in obtaining them. Business disruptions, both from natural occurrences and manmade, are occurring more frequently at the same time as business continues to get more complex. To exacerbate the issue, business continuity practitioners are increasingly expected to do more, and often with fewer resources and in condensed timeframes. The SIPOC tool from Lean and Six Sigma, which considers suppliers, inputs, process, outputs and customers, gives business continuity practitioners a practical alternative. By using the experiences, expertise and tools of other professions in a transdisciplinary approach, it is possible to accomplish the continuity imperatives of the business while adding value to the organisation when resources available to the practitioner are constantly being compressed.

Keywords: SIPOC, BIA, business continuity, business disruptions, Lean, Six Sigma, continuity imperatives

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INTRODUCTION

According to Rainer Hübert, 'The business impact analysis [BIA] provides unreliable and incomplete information, which needs lots of time to be created, and is a compound of workarounds to make up for strategic faults in its basic concepts'.[1] The SIPOC tool — used for analysing suppliers, inputs, process, outputs and customers — offers a simple, nimble and rapidly developed solution to these challenges. In process improvement the SIPOC is the ideal tool for identifying all relevent elements of a process improvement project before work begins. It helps define a complex project

that may not be well scoped and is typically employed at the measure phase of the Six Sigma DMAIC (define, measure, analyse, improve and control) methodology. It is similar and related to process mapping and 'in/out of scope' tools but provides additional detail.[2]

In his book *The Leader's Handbook*, Peter R. Scholtes describes the SIPOC as an elaboration of the systems diagram used by Dr Edward Deming in his lectures to Japanese industry leaders in the summer of 1950.[3] Scholtes is often credited with developing the SIPOC, although the evidence supporting this is mostly anecdotal.

The SIPOC is an unpretentious and intuitive process diagramming tool for identifying suppliers, inputs, process, outcomes and customers. Figure 1 illustrates a SIPOC in its most basic form. The SIPOC's origins can be traced to Edward Deming and the Total Quality Management (TQM) movement. TQM evolved from Deming's work in the 1940s around the concept of a manufacturing process as a complete or integrated system rather than a series of unrelated processes. Work in an organisation can be explained by a collection of SIPOCs — steps that precede and steps that follow; SIPOCs within larger SIPOCs within still larger SIPOCs.[4] This concept supports the easier identification of improvement opportunities by showing who supplies inputs to a process, what they supply, what that process delivers and to whom, and how the process relates to the larger system. Using a SIPOC within a SIPOC can provide clarity to a process by describing in ever-increasing detail the relationship between a process and its dependencies to the processes preceding and succeeding it in the delivery chain.

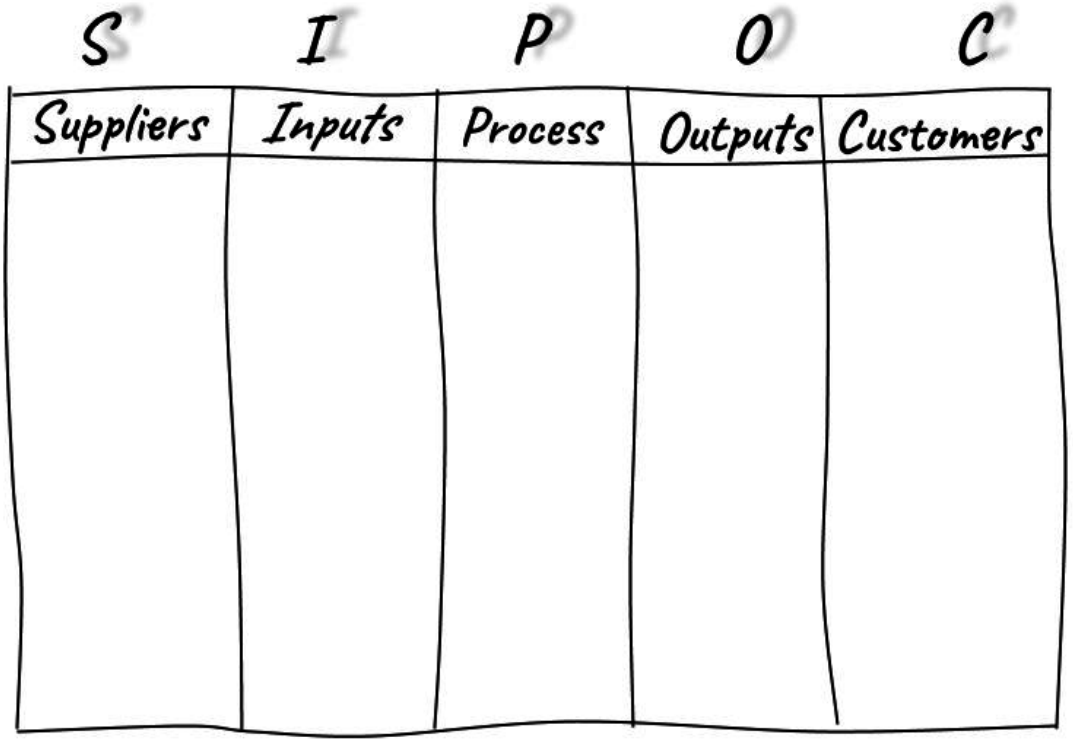


Figure 1 A SIPOC in its most basic form

A SIPOC's value and benefit are widely known and embraced in quality management disciplines for being able to deliver a quick, simple and easy-to-understand overview of a process and its dependent components. However, its value for addressing the challenges faced by business continuity professionals, particularly those of a BIA, appears to be almost completely obscured to the profession.

WHY A SIPOC?

Simplicity

Of all the tools utilised by Six Sigma and lean practitioners, the SIPOC is arguably one of the most intuitive and easy to use. Once the recipient understands the acronym, the SIPOC essentially requires no further explanation.

From the highest-level overview of the delivery chain to the most minute processes, SIPOCs can provide macro views of the operational structure down to a micro-examination of individual tasks that support a process, team, department or business unit and take one anywhere up and down through the delivery chain as efficiently as zooming in or out on a map, as in Figure 2.

Considering the versatility, speed and ease of making a SIPOC, its application as an indispensable tool for the business continuity (BC) practitioner becomes obvious.

Time/cost savings

A common lamentation among BC professionals across sectors and geographies is the lack of time and resources. BC professionals are continually called on to do more with less. In the most recent survey conducted by Continuity Central,[5] respondents were asked to report on 'the biggest challenge that may hold back business continuity developments within your organisation during 2018'. The survey found lack of time to be the second highest ranked challenge, with 12.9 per cent of respondents expecting this to be the top challenge in 2018, a dramatic increase from just 2.5 per cent in 2017.

At the time of writing, there is no universal industry standard for measuring the return on investment that business continuity provides an organisation. In a recent white paper, however, David Lindstedt Ph.D., PMP, CBCP[6] proposed

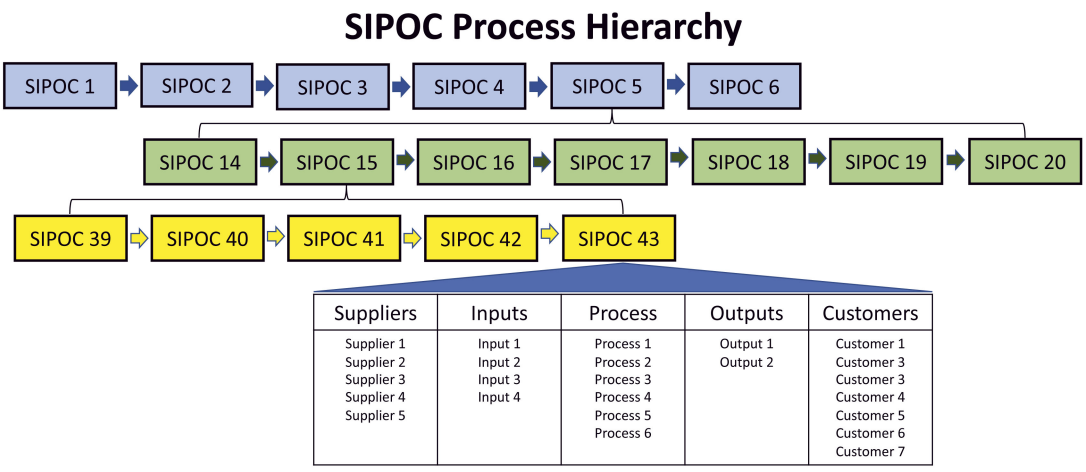


Figure 2 Business process

using the recovery value unit (RVU) to measure business continuity value and calculate time to value for business continuity activities. The RVU proposed is the estimate of the value an activity provides to increase an organisation's actual continuity and recoverability capabilities. Lindstedt's paper compares the estimated time to complete a BIA as outlined in the Business Continuity Institute's 'Good Practice Guidelines' versus utilising a SIPOC in the same context. Although the comparison is not done with empirical data, as none exist, it is a valuable exercise for providing insight into the effort it takes to complete an industry-accepted BIA as opposed to a SIPOC. In the hypothetical comparison, the BIA and the SIPOC were both estimated to provide the same 198 RVUs of business continuity value, but the time to complete the BIA was conservatively estimated to take 870 hours, while the SIPOC would have been completed in 84 hours. The SIPOC, providing the most relevant and reasonably attainable information obtained by completing a BIA, scored a time to value (TTV) of 236 per cent, while the traditional BIA scored only 23 per cent TTV (BIA: 198 / 870 = 23 per cent, SIPOC: 198 / 84 = 236 per cent). Even without empirical data to substantiate the hypothesis, there can be no doubt that the SIPOC delivers much greater efficiency in discovering critical processes, suppliers, customers and dependencies than a BIA. A SIPOC takes significantly less time to complete than a BIA, while providing the essential information promised from the BIA about a process to determine its value for recovery.

The debate over time and effort when completing a BIA compared with the relative value, as well as the relevance of the information obtained, is a strongly contested issue among BC professionals. In an effort to strike a balance between time and value, there are many variations of the BIA. This typically involves eliminating those parts prescribed by traditional BIA standards where the information to obtain a quantitative response is either unavailable, inaccessible or the time required to obtain it is excessive compared with the value. Although this is not atypical for the BC profession, as most all requirements for business continuity are delivered in the context of guidelines and one size does not fit all, it does make it difficult to know exactly what information the BIA will ultimately include or how accurate that information will be, given that certain required information is often unattainable or based on guesswork.

As an example, consider activity-based cost accounting to determine the financial impact of a process being unavailable for a given period. Although it is theoretically possible to determine critical business functions using a BIA (see Figure 3), very few businesses have activity-based cost accounting built into their day-to-day processes or as a line item on the general ledger. In an organisation where this does not exist, it would be virtually impossible to determine, with an acceptable degree of accuracy, the financial cost of a process being unavailable for any period of time. The extent to which the disruption affected the process would also need to be known. The specific time and day a disruption occurred would have to be factored into the equation as well. A payroll system being unavailable on the day it is used to run payroll would undoubtedly incur much more cost for the organisation than if that system were to be rendered unavailable three days after payroll had been run. Financial impact would be a guess at best and often an uneducated one because the data needed to determine the cost ramifications do not exist or are not available to the BC practitioner; thus, the cost of the system being down for a specific period is excluded from the BIA.

$$mrt(n) = \begin{cases} MTPDn, & \text{if } N \text{ is a top-goal;} \\ min\{mrt(m)+t) \mid n \xrightarrow{t} m\}, & \text{otherwise.} \end{cases}$$

$$ADV(S) = \frac{1}{\sum_{G \in significant\text{-}goals} LE(G) \times Cost(S)}$$

$$LE(G) = [[\lambda(G) - Max.\lambda(G)]] \times Utility(G) \times [[TPD(G) - MTPD(G)]]$$

Figure 3 The formula to determine critical business functions using a BIA

Source: Asanar, Y. and Giorgini, P. (2008) 'Analyzing business continuity through a multi-layers model', available at: https://pdfs.semanticscholar.org/6e26/4c79dfe3ec446fa1ebd9539189f373229086.pdf

Determining a priority for restoration is problematic as well. The day and time of a process being unavailable would most probably change the priority of restoring it. For an independent mortgage bank, a document preparation system being unavailable at 2.00 in the afternoon on the first few days of the month is exponentially less critical than on the last few days — especially if it were the last day to close refinance transactions with a three-day rescission period that must expire before funds may be disbursed. An outage at this time of the month would require all hands on deck to minimise the impact to everyone down the delivery chain from the closing department, or — in the language of the SIPOC — the customers.

Although a SIPOC does not specifically address the prioritisation of processes for restoration after a disruption, it can be very useful in understanding the relationships and dependencies between processes, suppliers and customers, and thus providing insight into what makes sense to prioritise based on immediate needs (Figure 4). By looking at organisations in a larger systemic context, aligning processes hierarchically, SIPOCs aid in validating or debunking assumptions regarding the criticality of a process by shedding an unbiased light on their relationships. Knowing where a process lives within the operational structure, what processes it supports and facilities, what subprocesses it has, which processes it receives outputs from and which processes receive its outputs, is all invaluable in determining disruption-specific restoration priority.

It is becoming increasingly more common to find BIAs adapted to meet the resources of the business or skill of the practitioner rather than to satisfy the original objectives of the analysis as prescribed in any given industry standard, further diluting the BIA's value for determining priority.

Business acumen

The BC programme is unlike any other in the business. It is one of the few activities to span the entire organisation, reaching across all business units, departments and processes. It reaches from the front line all the way up to the executive suite. It stretches from the suppliers of raw materials all the way to the end user. To plan effectively for disruptions, the BC practitioner must understand the entire business operation.

By combining SIPOCs in an organogram (Figure 5), anyone, including employees, management, executives and regulators, can see and easily understand the interdependencies and relationships between processes within the business, from top to bottom and front to back.

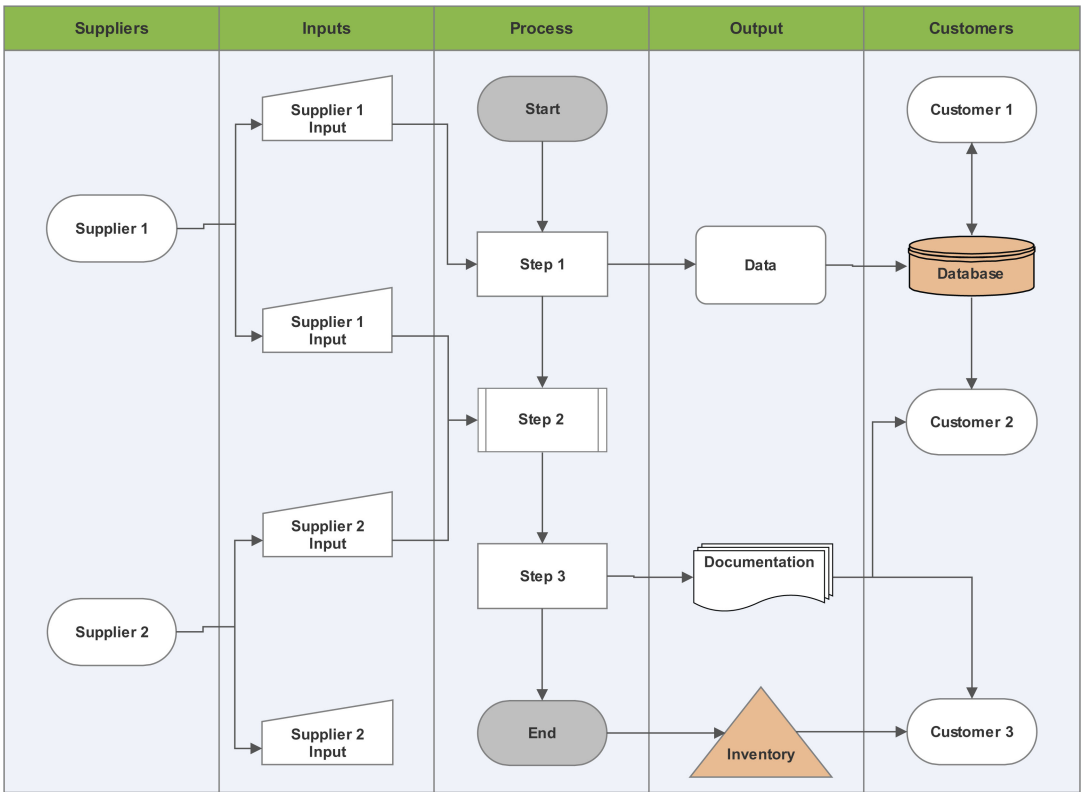


Figure 4 Using the SIPOC to understand the relationships between processes, suppliers and customers

Source: https://d2slcw3kip6qmk.cloudfront.net/marketing/pages/chart/examples/sipocdiagram.svg

BC practitioners can provide significant, immediate value throughout the entire organisation by building and using SIPOCs. No other tool is as easy to use and generates better visuals of organisational processes. The BC practitioner is in a unique position to grow their influence and build business acumen by working with process owners, teams, departments and business units to develop SIPOCs for their processes, providing much greater benefit to the process owner than a BIA, with the potential to be used in a greatly expanded extent within the business.

DESIGNING A SIPOC DIAGRAM

One of the appeals of the SIPOC is the ease with which one can get and keep participants engaged through the interactive nature of the process and the benefits they derive from it. Preferences for what is used to create a SIPOC are both personal and situational. Almost anything works — large coloured adhesive notes attached to walls (Figure 6), whiteboard markers on windows, tables in a word-processing document or a spreadsheet displayed on paper or screen. Whatever encourages participation with the process owner, team, department or whoever needs to be involved to capture the information about the process is the right way to do it.

Another distinct advantage of the SIPOC is its flexibility. There are several typical variations for how SIPOCs are arranged and the order in which each component is completed. The acronym

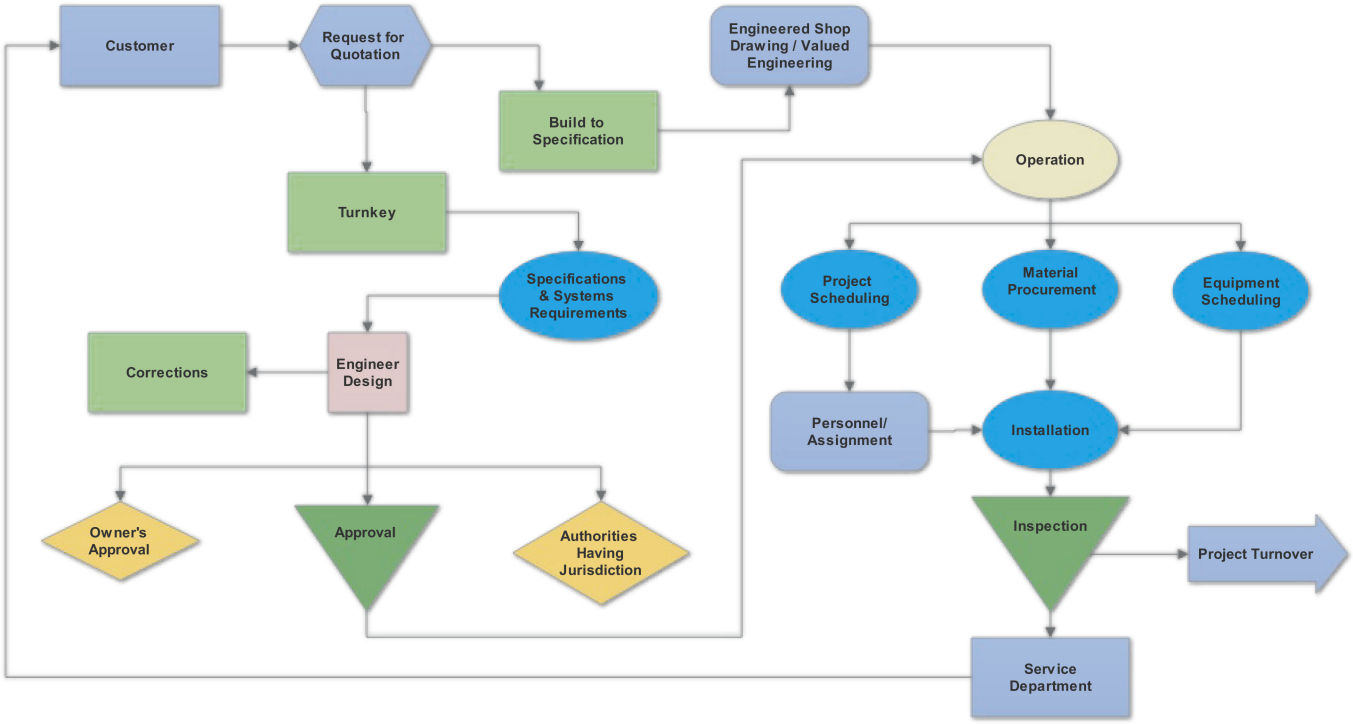


Figure 5 The organisational structure for total quality management

Source: https://www.conceptdraw.com/examples/a-comprehensive-organogram

and diagram are commonly reversed, as in a COPIS, COPIS placing customers first. Another structure is PISOC, which puts the process at the beginning.[7] The structure of the diagram and the inclusion of additional information are guided by the situation, application and experience.

Integrated SIPOCs (as in Figure 7) are another variation that include codes to connect inputs, suppliers, outputs and customers to the specific steps of the process the SIPOC is illustrating, directly linking all components of the SIPOC. This type of SIPOC often positions suppliers in blocks directly above inputs and customers directly above outputs on the diagram, with the process steps in a centre block. The first step in the process would be designated as P1, and anything that linked to that step would have 1 as part of its code. Any input of P1 would be labelled as IP1.# (the first input of the first step in the process). The # represents the number of inputs for that specific step listed sequentially. The supplier of those inputs for step 1 would be labelled as SIP1.# (supplier of the first input of the first step in the process). Again, a sequential # represents each supplier for that input. There can be multiple suppliers, inputs, outputs and customers of any given process step. OP1.# (output of the first step in the process), the # again represents the number of outputs for that process step. COP1.# (customer of the first output of the first step in the process) would designate any customer of the output of the first step. Each customer would be given a different sequential number, which would come immediately after the dot. The next step in the process would be labelled P2, and so forth, until all relationships have been established.[8] Integrated SIPOCs attest to the flexibility

Figure 6 Integrated SIPOCs

Source: https://www.stratexhub.com/stratex-hub/how-to-use-sipoc-for-better-results/

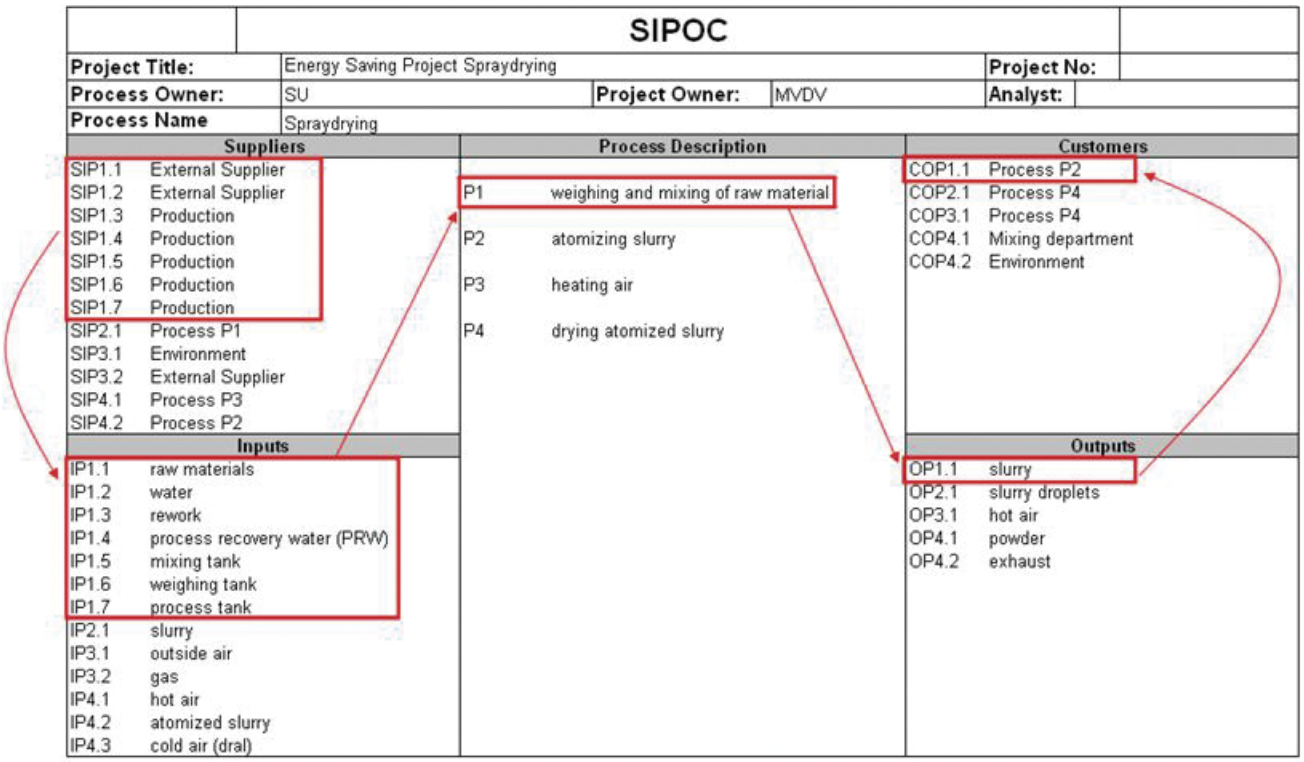
of the tool but provide a greater level of detail and precision than is generally necessary for understanding the relationship between processes for the business continuity professional.

Layout for a SIPOC diagram is generally, but not required to be, in a columnar arrangement, as in Figure 8, with five vertical columns, each listing one word from the SIPOC acronym. There is no prescribed width or length to the columns other than to be sized adequately to capture all the information in the appropriate column.

There are abundant resources to guide the creation of a SIPOC. A quick internet search for the acronym will produce an extensive list of guides, images and templates.

COMPLETING A SIPOC

When creating a SIPOC, it is typical to start with the process, regardless of where it is positioned on the diagram. The process is the centre point of the SIPOC and the component to which all other information is associated. The steps of the process the SIPOC is defining should be sequential in flow and generally not exceed six, with a definitive start and end point. An additional step or two may be included for clarity, but if more than six steps are needed to define a process, this suggests that the process would be better represented by breaking it into more detailed subprocesses. Once the process has been defined, it makes no difference which section of the SIPOC is completed next. Working on one section



SIPOC					
Project Title:	Energy Saving Project Spraydrying			**Project No:**	
Process Owner:	SU	**Project Owner:**	MVDV	**Analyst:**	
Process Name	Spraydrying				

Suppliers		Process Description		Customers	
SIP1.1	External Supplier	P1	weighing and mixing of raw material	COP1.1	Process P2
SIP1.2	External Supplier	P2	atomizing slurry	COP2.1	Process P4
SIP1.3	Production	P3	heating air	COP3.1	Process P4
SIP1.4	Production	P4	drying atomized slurry	COP4.1	Mixing department
SIP1.5	Production			COP4.2	Environment
SIP1.6	Production				
SIP1.7	Production				
SIP2.1	Process P1				
SIP3.1	Environment				
SIP3.2	External Supplier				
SIP4.1	Process P3				
SIP4.2	Process P2				

Inputs		Outputs	
IP1.1	raw materials	OP1.1	slurry
IP1.2	water	OP2.1	slurry droplets
IP1.3	rework	OP3.1	hot air
IP1.4	process recovery water (PRW)	OP4.1	powder
IP1.5	mixing tank	OP4.2	exhaust
IP1.6	weighing tank		
IP1.7	process tank		
IP2.1	slurry		
IP3.1	outside air		
IP3.2	gas		
IP4.1	hot air		
IP4.2	atomized slurry		
IP4.3	cold air (dral)		

Figure 7 An Integrated SIPOC

Source: http://blogs.mtu.edu/improvement/files/2015/04/SIPOc.png

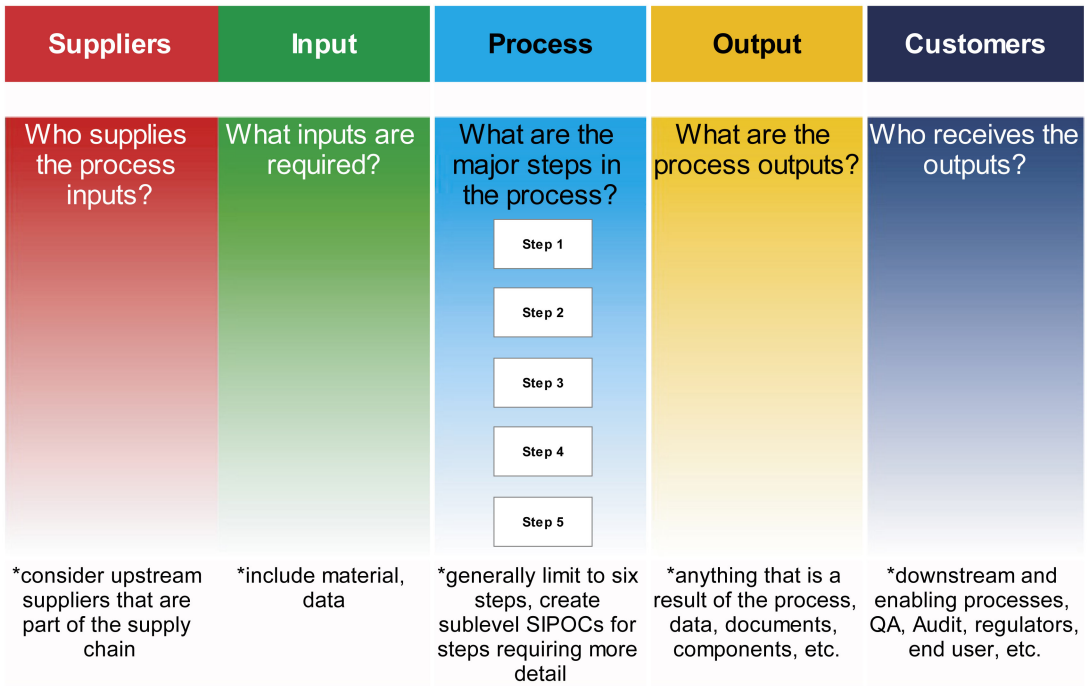


Figure 8 Mechanisms of a SIPOC

Source: http://sipoc.info/wp-content/uploads/2014/08/Columns-in-a-SIPOC.png

of the SIPOC will trigger information that will be needed to complete another. Move horizontally and vertically through the SIPOC until all pertinent information for the process has been captured.

Capturing data

The key to completing a SIPOC is having the right participants involved. If a SIPOC is being completed for a frontline process, it is more beneficial to consult with a team member who performs the process than a manager or executive. Even when completing a higher-level SIPOC that encompasses multiple processes, it makes sense to involve someone who is intimately familiar with the subprocesses to avoid material omissions or inaccuracies. It often takes someone who performs the day-to-day process to reveal the landmines, skunks and funny things. The purpose at this stage is to capture the information about how, who and what.

Everyone in the room will have something to contribute to the SIPOC and it is the BC practitioner's job to cultivate that collaboration. Encourage discussion until there is agreement that process steps are complete, accurate and in the correct order, with clear beginning and end points, and everything has been captured. Ask questions regarding how, who and what to facilitate this process. It is possible that not all information will be captured at the initial meeting and the creation of the first SIPOC; with persistent questioning, however, any omissions will usually be very minor in nature. At this point, it is important to ensure the SIPOC is an actual representation of the current process rather than a procedural rendition. When creating a SIPOC, it is not uncommon for participants to describe what is in their procedural manual instead of what they *actually* do. This can exist, for example, when a workaround has been developed for a system issue or an unmanageable or ineffective part of the process.

Suppliers

A supplier in a SIPOC is any company, person or system that supplies the inputs necessary to complete the steps outlined in the process section. Completing this section can require additional questioning to uncover all the suppliers. For example, in an automated system when there is a hard stop before a product or service can move to the next step, the process owner may not immediately know who is responsible for clearing that stop, just that their process cannot move forward until it is cleared. Keep questioning until it is not only known what must be done but who must do it. Even in higher-level processes, it is not always evident who triggers an action or where it is triggered for the next step. Even ubiquitous sources such as e-mail and telecommunications should be included as suppliers if any of the inputs to the process come through these sources.

Inputs

Inputs are everything a process requires to complete all the steps. This would include materials, notifications, stops cleared, documentation, verifications, etc. If not having it can prevent the process from being completed, it is an input. Even when there is a workaround in the event of disruption, if it is required in normal operation, then it is included as an input.

Process

The process is the step-by-step progression of actions necessary to deliver the outputs to the customer. Generally, a process is described in six steps, but not more than eight. If it takes more than eight steps to outline the process, it is advisable to move up a level to create a SIPOC that

represents an overview of those steps, then create SIPOCs for each step of the SIPOC that requires more detail. It is only necessary to create SIPOCs for those process steps where additional detail is useful. Not every process step in a SIPOC warrants a sub-SIPOC — only those where the additional clarity provides value.

The steps should be written in a verb-object format with contextually meaningful modifiers such as adjectives, adverbs or indirect objects. It is also important to establish the process boundaries at this stage in terms of which event triggers the process and which event marks the end of the process.[9]

Outputs

Outputs are anything that is produced by completing the actions of the process. As with inputs, this could include materials, notifications, stops cleared, documentation, verifications, etc.

Customers

Customers are both internal and external. Anyone in the delivery chain that is a recipient of the output is a customer.

Good practices

- Process names define the how with a verb and noun — do not use past tense;
- Process names should not describe performance requirements or improvement objectives;
- Outputs describe what a process delivers, not what it achieves;
- Inputs are worked on by the process and should trigger an action.[10]

Time and scope constraints

Often added to a SIPOC diagram, and sometimes the acronym, is the letter 'R' for 'requirements'. Knowing customer requirements is critical when looking at process improvement and can be essential information in resolving any confusion that might exist regarding who the actual customer of a process is. Requirements are typically recorded in the same vertical column where customers are listed because it is the customers' requirements that are being captured. Requirements often obtained when completing a SIPOC for process improvement include the customer's expectation of timing and scope.

It could be delivery in a certain way, at a precise time or within a specific amount of time. Ordering premium coffee from a drive-up could have a customer expectation of a environmentally friendly coffee cup and sleeve with the lid on tight, sugar and creamer in a bag with two napkins, a stir straw and within two minutes for no more than $5.

Time and scope are constraints in disruption response just as with project management. Constraints in a project are illustrated by a triangle with costs/resources, time and scope each on different sides (Figure 9). If any of the three constraints are adjusted, one or both remaining constraints must be adjusted (restricted or expanded) to compensate. Likewise, when planning for recovery after a disruption, knowing how much of the process must be recovered and by when or within what timeframe is essential information when developing recovery strategies. Following a disruption, a process may not immediately require 100 per cent of its capabilities to get by or need them immediately. One person may be able to run payroll, or it may not be critical to be able to run it until a week from Tuesday. BC practitioners would be well served to record time and scope constraints on a SIPOC when creating it.

Recovery time objectives is another area of intense deliberation and disagreement. Instead of looking at the number of hours in which a process must be recovered as a target to hit, use a SIPOC to understand

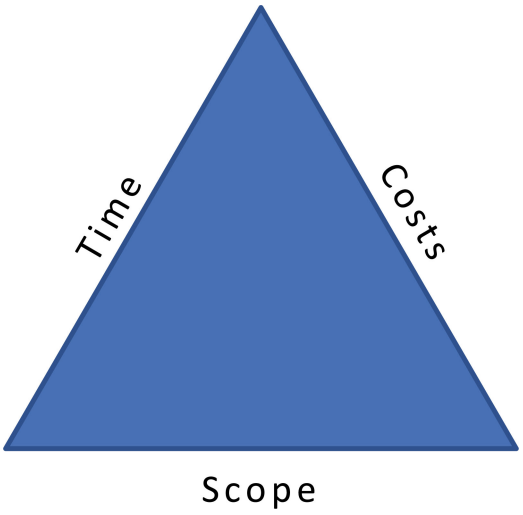


Figure 9 Project Constraint Triangle
Source: https://www.pmi.org/learning/library/managing-challenges-triple-constraints-6884

how time and scope constrain the recovery process in relation to its interdependencies and customers' expectations. No one typically knows the nuances of this better than the individual(s) who owns or executes the process. Whether the constraint is being controlled by dependent processes, expectations, contractual agreements or regulatory mandates, the process owner and their team generally have the best feel for when and what their process must be able to complete to meet customer requirements and stakeholder expectations.

Priority for restoration and speed of recovery will almost always depend on when the disruption occurs and its actual impact. As in the payroll and loan closing examples discussed previously, 10:00 am Tuesday the week payroll is run or the last day of the month for refinances to close and still allow funding forces significant time constraints that would not be experienced otherwise.

Be sure to document the constraint where it is visible to anyone viewing the SIPOC.

CONCLUSION

SIPOCs are an emerging practice in business continuity but have been a staple of process improvement professionals for decades. Using the experience and expertise of other disciplines in a transdisciplinary approach will accelerate the business continuity profession and transform the value the BC practitioner can bring to the organisation. SIPOC is just one of many tools that can be brought over to make the work of a BC practitioner more effective and value-driven.

Developed by Taiichi Ohon when he was an executive at Toyota, lean manufacturing peels away everything that does not add value to the customer. Applying lean thinking to business continuity would seek to eliminate all those activities that organisations should be unwilling to pay for because they provide no tangible benefit to disruption response or recovery.

In the words of Buckminster Fuller:

> 'in order to change an existing paradigm you do not struggle to try and change the problematic model. You create a new model and make the old one obsolete. That, in essence is the higher service to which we are all being called'.[11]

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