

Teaching Tip
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Teaching Tip

BPIsim: A Hands-On Simulation to Teach Cash-to-Cash Manufacturing Operating Cycle Processes in a Purchasing, Operations, and Supply Chain Management Context

Vincent G. Whitelock
College of Business Administration
Central Michigan University
Mount Pleasant, MI 48858, USA
white3v@cmich.edu

ABSTRACT

This paper presents a hands-on simulation that is conducted in an introductory integrated supply chain management course using enterprise resource planning concepts associated with the Cash-to-Cash Manufacturing Operating Cycle. More specifically, this activity simulates the activities in the procure-to-pay, plan-to-produce, and order-to-cash business processes to provide participants the opportunity to learn integration of key business processes in a purchasing, operations, and supply chain management context. The hands-on simulation is called Business Process Integration Simulation, or BPIsim. Participants collaborate on a five-member supply chain team comprised of an end-user, a distributor/dealer, a manufacturer (OEM), and two suppliers. While partaking in the simulation, participants actively experience the exchange of tangible resources (e.g., preprinted documents; prop cash money; packaging; and component, raw, semi-finished, finished, and trading goods inventories, etc.) and construct tangible products for the benefit of the customer. When the simulation is complete, the participants will have learned major ERP concepts and the five major activities associated with plan, source, make, deliver, and return management processes that are prominently highlighted in the seminal Supply Chain Operations Reference (SCOR) Model. Quantitative and qualitative data indicate that the hands-on simulation is not only intuitive, engaging, and fun, but also a highly-effective experiential learning activity to improve understanding of key business processes that span across five key supply chain members.

Keywords: Active learning, Business processes, Enterprise resource planning (ERP), Experiential learning & education, Role-play, Simulation, Pedagogy

1. INTRODUCTION

The literature about processes and purchasing, operations, and supply chain management (POSCM) has defined the various terms associated with these concepts in many ways, often causing confusion to its readers. For purposes of this manuscript, these terms are defined as follows. Process is defined as any activity, or group of activities, that takes one or more inputs, transforms them, and produces one or more outputs for its customers (Jacobs and Chase, 2018, pp. 4-6). Purchasing is defined as a “functional group (i.e., a formal entity on the organizational chart)” as well as a “functional activity (i.e., buying goods and services)” (Monczka et al., 2016, p. 11). This paper focuses on the activity. Operations refers to “manufacturing and service processes used to transform the resources employed by a firm into products desired by customers” (Jacobs and Chase, 2018, pp. 4-6). Supply chain refers to “processes that move information and material to and from the manufacturing and service process of the firm” (Jacobs and Chase, 2018, pp. 4-6).

Supply chain management (SCM) is about planning, organizing, managing, and integrating key value-adding business processes, not only within firms, but also between and across firms in a supply chain (Whitelock, 2015). SCM, essentially, encompasses all the activities and processes associated with end-to-end customer interactions, from sales order entry through collection of payment for delivered products and for services that are rendered (Whitelock, 2012). In these intra- and inter-organizational business relationships, leaders navigate complicated networks that include “suppliers back to the point of origin and all products/services out to the point of consumption” (Lambert and Cooper, 2000, pp. 67-68). Improvements in process efficiency and effectiveness of each member of the supply chain in particular, and the entire supply chain in general, depends on the understanding of how to properly integrate key business processes and eliminate waste from their processes (Whitelock, 2018). The objective is to make continuous improvement decisions that affect the entire organization, thereby resulting in improved productivity by efficiently and effectively purchasing resources, transforming

resources, and delivering products and services that meet customer requirements (Whitlock, 2019b). As one researcher stated, “the long-term winners are those who can integrate various technology components into systems, preferably in a way that allows continuous improvement” (Topi, 2019). Therefore, for business leaders to manage the supply chain effectively, they require proper training and cross-functional and cross-disciplinary integration of resources, especially if organizations are to regularly meet or exceed customer expectations (Whitlock, 2019a).

Learning key business processes, however, can be difficult for most individuals because of their non-concrete nature. Moreover, teaching the integration of key business processes to most people is also challenging, especially since sound programming requires substantial commitment of resources in terms of qualified instructors, effective pedagogy, operational lesson plans, and, in some cases, state-of-the-art computer software, hardware, and support. Some researchers even report that pedagogical approaches to resource challenges such as these can also include “lecture, homework exercises, case analyses, and field trips” (Grandzol and Grandzol, 2018).

Nevertheless, in today’s environment, employers expect new hires to have an appreciation for business processes and an understanding of how an organization functions (Fedorowicz et al., 2004; Angolia and Pagliari, 2018). However, some researchers still argue that, even though one may have some understanding of how an organization operates, it is still irrational to presume individuals, who have not had practical experience applying these concepts in active-learning environments, are capable of successfully executing them in practice (Coy, 2016). It is not surprising that many individuals, particularly students who lack first-hand experience on how a business works from the inside, have difficulty integrating processes across functional areas.

Even though these individuals may have attained some business experience in one or two functional areas, such as in communications, finance, human resources, marketing, or sales, many of them have only a narrow appreciation for the power of modern, integrated enterprise systems. For these individuals, a horizontal integrated perspective of the firm can be very abstract, and unless the individual participated in an internship, or had relevant job experience, he or she is unlikely to have had the first-hand experience to which one can relate these foundational concepts in an integrated way (Cleary, 2018).

For these and other reasons identified in this paper, the hands-on simulation called Business Process Integration Simulation (BPISim) was designed, constructed, implemented, and evaluated using a pretest-treatment-posttest assessment methodology. BPISim uses tangible products (e.g., preprinted documents; prop cash money; packaging; and component, raw, semi-finished, finished, and trading goods inventories, etc.) to give participants first-hand experience in simulating the activities in the procure-to-pay, plan-to-produce, and order-to-cash business processes. This hands-on simulation provides an innovative opportunity for instructors to teach effectively, and participants to actively learn, the integration of key business processes associated with ERP concepts in a purchasing, operations, and supply chain management context.

1.1 Background

Over the last couple of decades, researchers have advocated the use of simulation games as pedagogical approaches to teach business concepts in areas such as teaching ERP concepts (Léger, 2006; Seethamraju, 2011; Shen, Nicholson, and Nicholson, 2015) and managing raw, work-in-process, and finished goods inventory in the inventory game (Meyer and Bishop, 2016). They have also promoted simulations in managing a supply chain (Webb, Thomas, and Liao-Troth, 2014), in managing ordering, carrying, and shortage costs in inventory (Umble and Umble, 2013), in bringing clarity to push versus pull concepts (Vaughan and Gardner, 2009), and in helping to understand supply chain dynamics in the beer game (Reyes, 2007). Not surprisingly, most of these researchers, from qualitative and quantitative perspectives, report positive learning outcomes (Sarkar and Kumar, 2016; Grandzol and Grandzol, 2018) from the use of simulation games as pedagogical approaches.

However, as stated earlier, many simulation games require a substantial commitment of resources and present barriers to many organizations seeking efficient, workable, and cost-effective pedagogical alternatives to teach the integration of business processes. Because of these obstacles, the author of this paper devised and proposed a hands-on simulation tool using tangible products to assist academics and practitioners in their mission to teach business process integration and help individuals learn the integration of key business processes associated with enterprise resource planning (ERP) concepts.

1.2 Teaching and Learning

Fundamentally, people’s brains absorb information in three ways – they hear, they see, and they feel (Padhy, 2012). In this respect, individuals who learn primarily by hearing are called auditory learners and prefer to hear information spoken to them. People who learn mostly by seeing are called visual learners and prefer to see information. Persons who learn predominantly by touching are called tactile learners and prefer to acquire information by touching and doing.

In order to accommodate the different styles of learning favored by participants in group settings, the author of this paper designed and constructed a hands-on simulation called BPISim to facilitate “teaching” and “learning by hearing, seeing, and touching.” The author first explains end-to-end business process activities using actual buying experiences shared by participants in the simulation workshop. Then the author walks through the end-to-end transaction process flows, step-by-step, while displaying the steps using an overhead projector and screen. Finally, the author engages the individual supply chain management team members in the end-to-end transaction flows using tangible, preprinted documents; prop cash money; packaging; and component, raw, semi-finished, finished, and trading goods inventories.

These three steps cater to three different learning styles – hearing, seeing, and touching – in order to enhance assurance of learning for the participants. When they start role-playing with tangible products, such as hard currency, manufactured parts, and standard forms and reports, it is then that the participants really connect the dots and capture the true essence of enterprise resource planning concepts highlighted by procure-to-pay, plan-to-produce, and order-to-cash business processes.

1.3 Business Process Integration Simulation

Business Process Integration Simulation (BPISim) is an innovative, cost-effective, pedagogical tool that provides a platform to accomplish the objectives of teaching and learning the integration of key business processes associated with the procure-to-pay, plan-to-produce, and order-to-cash processes inherent in the Cash-to-Cash Manufacturing Operating Cycle. Quantitative and qualitative data obtained from the participants indicate that the hands-on BPI Simulation is not only intuitive, engaging, and fun, but also a highly-effective experiential learning activity to improve understanding of key business processes that span across five key supply chain entities.

BPISim, like the research in Snider and Eliasson (2009) and Grandzol and Grandzol (2018), falls into the category of a tangible product. Tangible product simulations are generally performed manually using three-dimensional products where participants physically make transactions and/or assemble something rather than input data into software packages run on computers. BPISim is uniquely designed to provide a standard tangible product platform for instructors to teach the integration of key business processes using enterprise resource planning concepts and supply chain management models in a classroom setting.

2. SIMULATION BLUEPRINT

2.1 Simulation Objective

The objective of the BPI Simulation is to mimic the activities in the procure-to-pay, plan-to-produce, and order-to-cash business processes in order to provide participants the opportunity to learn the integration of key business processes in a purchasing, operations, and supply chain management context. While partaking in the simulation, participants actively experience the exchange of tangible resources (e.g., preprinted documents; prop cash money; packaging; and component, raw, semi-finished, finished, and trading goods inventories, etc.) and construct tangible products for the benefit of the customer. When the simulation is complete, the participants will have learned the major activities associated with plan, source, make, deliver, and return processes that are prominently highlighted in the seminal Supply Chain Operations Reference (SCOR) Model (Stewart, 1997). SCOR, structured in five levels based on a plan, source, make, deliver, and return framework, is the “first cross-industry framework for evaluating and improving enterprise-wide supply-chain performance and management” (Stewart, 1997).

With the BPI Simulation, instructors possess the flexibility to use any “buildable” product they desire. The duration of the BPI simulation can be shortened or lengthened depending on the number of components required to build the chosen product and/or the number of suppliers needed to source the components for the selected product.

The BPISim, as configured in this research, is designed for a 50-minute time period and can accommodate a variety of course sizes, classroom layouts, and participant’s academic and work experiences. The BPISim costs a one-time fee for materials of about \$15.00 per five-person supply chain management team. It is scalable and can handle virtually any number of participants limited only by size of facility, number of document sets, and, more importantly, the number of “buildable” products. The BPISim has been successfully implemented with as few as 2 participants and as many as 60 participants in a single session. However, the recommended team size is five participants per team with each participant assuming one of the five member-roles of the supply chain. This five-member team number conveniently aligns with the five members of the supply chain, identified as: 1) End-User; 2) Distributor/Dealer, 3) Manufacturer (OEM), 4) Supplier 1, and 5) Supplier 2.

2.2 Required Materials

In the supply chain member roles, with the aid of preprinted business forms and documents, prop money, packaging, and component parts, BPISim participants actively engage in the hands-on experiences associated with the transactions of ordering, sourcing, making, delivering, and paying for the products provided by the supplier for the benefit of the end-user. Table 1 depicts the tangible materials required at the start of the hands-on BPI Simulation for each member of the supply chain in order to perform his or her role during the simulation.

Table 1 includes the simulated purchased cost of materials identified in the simulation and the tangible product that must be distributed to each member at the start of the simulation. The table includes the product inventory, the required amount of prop cash money needed to purchase the required material, and the designated document type, along with an identifying “Doc. No.” for each preprinted document and business form required in each transaction for each supply chain member. Table 1 also includes sources at the bottom of the table where tangible and buildable products can be purchased for use in this and other BPI simulations.

Item	Supplier 2	Supplier 1	Manufacturer (OEM)	Distributor/ Dealer	End-User
Starting Inventory*	Component Parts and Packaging	Sub - Assembly Parts	None	None	None
Purchase Cost of Materials	\$19.00	\$10.00	\$29.00	\$38.00	\$50.00
Prop Cash Money for Material Purchases*	None	None	\$19.00 & \$10.00	\$38.00	\$50.00
Preprinted Documents and Business Forms	Supplier 2	Supplier 1	Manufacturer (OEM)	Distributor/ Dealer	End-User
Sales Order					Doc. 1
Packing Slip/ Delivery Note				Doc. 2	
Invoice				Doc. 3	
Purchase Requisition				Doc. 4	
Purchase Order				Doc. 5	
Packing Slip/ Delivery Note			Doc. 6		
Invoice			Doc. 7		
Purchase Requisition			Doc. 8		
Purchase Order			Doc. 9		
Packing Slip/ Delivery Note		Doc. 10			
Invoice		Doc. 11			
Purchase Requisition			Doc. 12		
Purchase Order			Doc. 13		
Packing Slip/ Delivery Note	Doc. 14				
Invoice	Doc. 15				
Bill of Materials (BOM)			Doc. 16		
Production Routing			Doc. 17		
<p>* Tangible Product Vendor: https://www.playmonster.com/brands/automoblox/; and Juvo Prop Cash Money on Amazon.com. Total Cost per Supply Chain Team is approximately \$15.00.</p>					

Table 1. Materials Required per Member on each Supply Chain Management Team

2.3 Participants' Interactions

In the procure-to-pay process of the hands-on simulation, participants review the preprinted documents and business forms that include the Purchase Requisition, the Purchase Order, the Packing Slip/Delivery Note, and the Invoice associated with products purchased from the provider. The participants then use the appropriate preprinted document to execute the transaction with the provider and exchange prop cash money for the materials provided to the purchaser of the materials.

In the plan-to-produce process of the hands-on simulation, participants review the preprinted documents and business forms that include the Bill of Materials (BOM) and the Production Routing associated with the materials and components purchased for their transformation into finished products. The participants then use the materials and components to systematically construct the relevant products as indicated in the applicable, preprinted BOM and Production Routing.

In the order-to-cash process of the hands-on simulation, participants review the preprinted documents and business forms that include the Sales Order, the Packing Slip/Delivery Note, and the Invoice associated with the relevant products. The participants then use the appropriate preprinted document to execute the transaction with the provider and exchange prop cash money for the materials provided to customer of the materials.

3. BUSINESS PROCESS INTEGRATION SIMULATION OVERVIEW

3.1 Cast of Characters

BPIsim features a fictitious original equipment manufacturer (OEM) named "Manufacturer (OEM)." Manufacturer (OEM) is the supply chain manager for the value chain and produces automobile vehicles for sale to its distributor named "Distributor/Dealer." Distributor/Dealer sells automobile vehicles from its showrooms to its consumer called "End-User." Manufacturer (OEM) purchases sub-assemblies, such as front, middle, and rear block sub-assemblies, from one of its suppliers named "Supplier 1." Manufacturer (OEM) also purchases trading goods, raw material, semi-finished material, and component parts, such as wheels, tires, and tops, etc., from another supplier named "Supplier 2."

3.2 Simulation Setting

Manufacturer (OEM) normally pursues a combination of make-to-stock, make-to-order, and assemble-to-order manufacturing strategies whereby it keeps its distributor, Distributor/Dealer, stocked with a limited number of automobile vehicles in order to keep consumers coming into the showroom to view its line of products. Occasionally, Manufacturer (OEM) also assembles automotive vehicles according to the specifications communicated by its customers.

For the purposes of this simulation, however, and to ensure that all participants fully and actively engage in all the key steps of the procure-to-pay, plan-to-produce, and order-to-cash business processes, the simulation begins with zero inventory in the possession of Distributor/Dealer and Manufacturer (OEM). The only inventory in the supply chain resides with Supplier 1 and Supplier 2.

Once Manufacturer (OEM) acquires all the components it needs from Supplier 1 and Supplier 2 to manufacture its products, Manufacturer (OEM) assembles the inputs into finished goods and then sells and distributes the automobile vehicles to its customer, Distributor/Dealer. Distributor/Dealer then sells automobile vehicles from its line of sport cars, sport sedans, sport vans, and pickup trucks to its customer, End-User. Table 2 provides detailed instructions to implement the business process integration simulation (BPIsim) with each five-person supply chain management team.

3.3 Process Transaction Flows Depicted

Figure 1 presents a depiction of the proposed process framework that explains the flow of transactions that occur within and between member organizations in the supply chain. The dotted arrows represent process transaction flows that occur internally between departments within member organizations. The solid arrows represent process transaction flows that occur externally between supply chain member organizations. The preprinted documents and business forms associated with the relevant transactions are listed as "Doc. #" where appropriate. Together, the process transaction flows in Figure 1 quickly highlight the integration of procure-to-pay, plan-to-produce, and order-to-cash business processes among the five members (End-User, Distributor/Dealer, Manufacturer (OEM), Supplier 1, and Supplier 2) of the supply chain.

Step Number	Step Description
1	Acquire the relevant Buildable Product associated with Doc. 1 – Doc. 17.
2	Acquire the relevant Prop Cash Money in denominations that support the transactions associated with Doc. 1 – Doc. 17.
3	Print the Preprinted Documents and Forms (Doc. 1 – Doc. 17).
4	Separate the Prop Cash Money into the following amounts: \$19; \$10; \$38; and \$50.
5	Disassemble the Buildable Product, associated with Doc. 1 – Doc. 17, into Component Parts and Packaging, and Sub Assembly Parts. Place the Component Parts and Packaging into a re-sealable plastic sandwich bag, and place the Sub Assembly Parts into another re-sealable plastic sandwich bag.
6	Assign each of the 5 person team members to one of the following Roles: Supplier 2; Supplier 1; Manufacturer (OEM); Distributor/Dealer; and End-User.
7	Give each of the 5 person team members a Name Tag corresponding to the role in which he/she will be playing. For example, Supplier 2, Supplier 1, Manufacturer (OEM), Distributor/Dealer, and End-User.
8	Give Prop Cash Money to each of the team members, according to the following: Supplier 2 (\$0); Supplier 1 (\$0); Manufacturer (OEM) (\$19 and \$10); Distributor/Dealer (\$38); and End-User (\$50).
9	Give Preprinted Documents and Forms to each of the 5 person team members, according to the following: <ul style="list-style-type: none"> • End-User (Doc. 1); • Distributor/Dealer (Doc. 2, Doc. 3, Doc. 4, and Doc. 5); • Manufacturer (OEM) (Doc. 6, Doc. 7, Doc. 8, Doc. 9, Doc. 12, Doc. 13, Doc. 16, and Doc. 17); • Supplier 1 (Doc. 10 and Doc. 11); and • Supplier 2 (Doc. 14 and Doc. 15).
10	Give Starting Inventory to each of the 5 person team members, according to the following: <ul style="list-style-type: none"> • End-User (None); • Distributor/Dealer (None); • Manufacturer (OEM) (None); • Supplier 1 (Sub Assembly Parts (i.e., Front Block, Front Connector, Middle Block, Rear Connector, and Rear Block, etc.)); and • Supplier 2 (Component Parts and Packaging (i.e., Brembo Brakes, Wheel Tire Assemblies, Roof Top, Posable Next Generation Figure, and Packaging, etc.)).
11	Run the Business Process Integration Simulation (BPISim) as depicted in “Figure 1: Process framework for transactions within and between supply chain member firms,” as described in “Section 3.3 Process transaction flows depicted,” and as reported in “Section 3.4 Process transaction flows explained.”

Table 2. Instructions to Implement Business Process Integration Simulation (BPISim) with each Five-Person Supply Chain Management Team

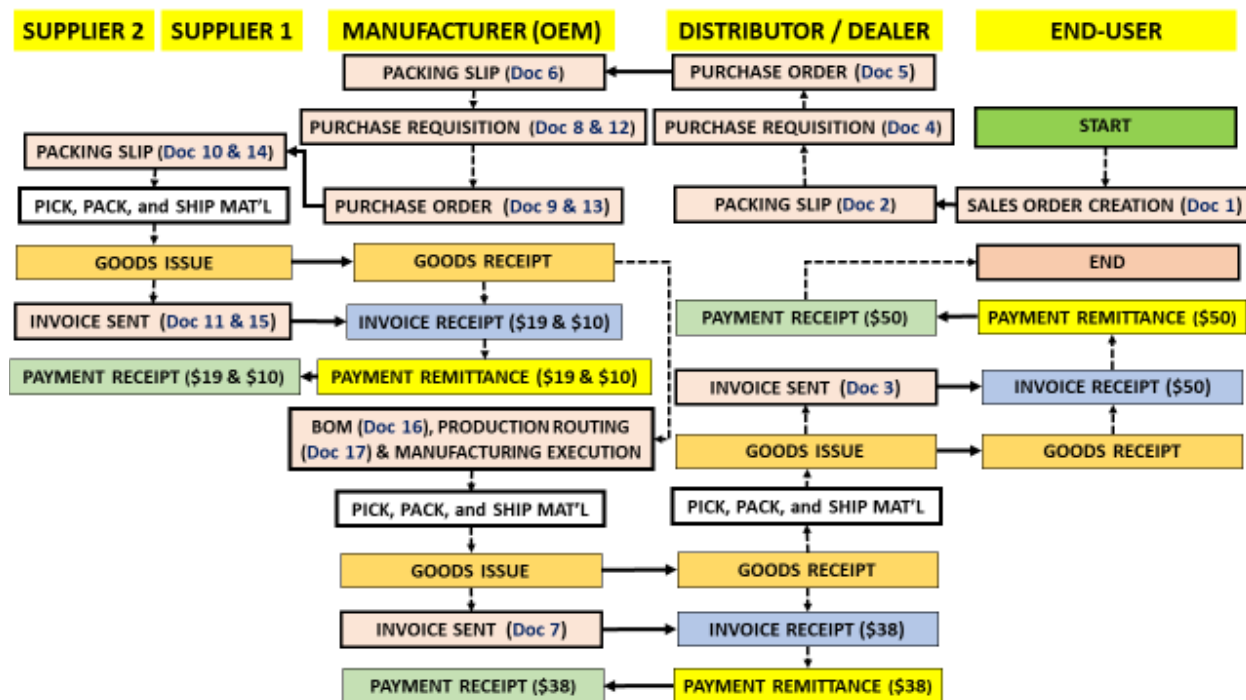


Figure 1. Process Framework for Transactions within and between Supply Chain Member Firms

3.4 Process Transaction Flows Explained

End-User goes to Distributor/Dealer to buy a particular automobile. Distributor/Dealer sits down with End-User and completes a Sales Order (Doc. 1) for the requested vehicle. Distributor/Dealer also creates a Packing Slip/Delivery Note (Doc. 2) for the warehouse to pick, pack, ship, and deliver the requested vehicle to End-User. Upon searching the enterprise system, Distributor/Dealer realizes that the requested vehicle is out-of-stock and informs End-User that it will take five business days to acquire the requested vehicle. End-User agrees to return in five days to pick up the requested vehicle and leaves the showroom. Distributor/Dealer immediately creates a Purchase Requisition (Doc. 4) for the requested vehicle and delivers it to the purchasing department. The purchasing department converts the Purchase Requisition (Doc. 4) into a Purchase Order (Doc. 5) and sends it to Manufacturer (OEM) to buy the requested vehicle.

Manufacturer (OEM) receives the Purchase Order (Doc. 5) from Distributor/Dealer and creates a Packing Slip/Delivery Note (Doc. 6) for the warehouse to pick, pack, ship, and deliver the requested vehicle to Distributor/Dealer. However, since the vehicle is out of stock and Manufacturer (OEM) has no components or sub-assemblies in inventory to manufacture or assemble the requested vehicle, Manufacturer (OEM) creates two Purchase Requisitions (Doc. 8 & 12). One Purchase Requisition (for Supplier 1 – (Doc. 8)) is for sub-assemblies, and the other Purchase Requisition (for Supplier 2 – (Doc. 12)) is for component parts. Manufacturer (OEM) delivers the two Purchase Requisitions (Doc. 8 & 12) to the purchasing department. The purchasing department converts the Purchase Requisitions (Doc. 8 & 12) into a Purchase Order for Supplier 1 (Doc. 9) and a Purchase Order for Supplier 2 (Doc. 13). The purchasing department then sends the purchase orders to

Supplier 1 (Doc. 9) and to Supplier 2 (Doc. 13) to buy the respective sub-assemblies and component parts to manufacture the requested vehicle.

Supplier 1 receives the Purchase Order (Doc. 9) from Manufacturer (OEM) and creates a Packing Slip/Delivery Note (Doc. 10) for the warehouse to pick, pack, ship, and deliver the requested sub-assemblies to Manufacturer (OEM). Supplier 1 creates a Goods Issue and sends an Invoice (Doc. 11) for the delivered subassemblies to Manufacturer (OEM).

Manufacturer (OEM) receives the sub-assemblies from Supplier 1 and records a Goods Receipt. Manufacturer (OEM) also receives an Invoice (Doc. 11) for the sub-assemblies from Supplier 1. Manufacturer (OEM) performs invoice verification (also known as “three-way matching”) by confirming data from the Purchase Order (Doc. 9), Packing Slip/Delivery Note (Doc. 10), and Invoice (Doc. 11) and remits cash payment (\$10.00) to Supplier 1. Supplier 1 receives cash payment (\$10.00), and the record is closed.

Supplier 2 receives the Purchase Order (Doc. 13) from Manufacturer (OEM) and creates a Packing Slip/Delivery Note (Doc. 14) for the warehouse to pick, pack, ship, and deliver the requested component parts to Manufacturer (OEM). Supplier 2 creates a Goods Issue and sends an Invoice (Doc. 15) for the delivered component parts to Manufacturer (OEM).

Manufacturer (OEM) receives the component parts from Supplier 2 and records a Goods Receipt. Manufacturer (OEM) also receives an Invoice (Doc. 15) for the component parts from Supplier 2. Manufacturer (OEM) performs invoice verification by confirming data from the Purchase Order (Doc. 13), Packing Slip/Delivery Note (Doc. 14), and Invoice (Doc. 15) and remits cash payment (\$19.00) to Supplier 2. Supplier 2 receives cash payment (\$19.00), and the record is closed.

Upon Goods Receipt of the purchased sub-assemblies and component parts from Supplier 1 and Supplier 2, respectively, Manufacturer (OEM) converts the planned independent order into a Production Order. The Bill of Materials (BOM) (Doc. 16) is reviewed, the Production Routing (Doc. 17) is followed, the “buildable” product (or vehicle, in this case) is assembled, and Manufacturing Execution is completed. (Note: To make the BPIsim even more engaging, have each of the five members on the supply chain management team take successive turns in assembling components for the buildable product as outlined in the “operation description” column of the Production Routing (Doc. 17) document.)

Manufacturer (OEM) executes the previously created Packing Slip/Delivery Note (Doc. 6) for the warehouse to pick, pack, ship, and deliver the requested vehicle to Distributor/Dealer. Manufacturer (OEM) creates a Goods Issue and sends an Invoice (Doc. 7) for the delivered vehicle to Distributor/Dealer.

Distributor/Dealer receives the requested vehicle from Manufacturer (OEM) and records a Goods Receipt. Distributor/Dealer also receives an Invoice (Doc. 7) for the requested vehicle from Manufacturer (OEM). Distributor/Dealer performs invoice verification by confirming data from the Purchase Order (Doc. 5), Packing Slip/Delivery Note (Doc. 6), and Invoice (Doc. 7) and remits cash payment (\$38.00) to Manufacturer (OEM). Manufacturer (OEM) receives cash payment (\$38.00), and the record is closed.

Distributor/Dealer executes the previously created Packing Slip/Delivery Note (Doc. 2) for the warehouse to pick, pack, ship, and deliver the requested vehicle to End-User. Distributor/Dealer creates a Goods Issue and sends an Invoice (Doc. 3) for the delivered vehicle to End-User.

End-User receives the requested vehicle from Distributor/Dealer and records a Goods Receipt. End-User also receives an Invoice (Doc. 3) for the requested vehicle from Distributor/Dealer. End-User performs invoice verification by confirming data from the Sales Order (Doc. 1), Packing Slip/Delivery Note (Doc. 2), and Invoice (Doc. 3) and remits cash payment (\$50.00) to Distributor/Dealer. Distributor/Dealer receives cash payment (\$50.00), and the record is closed.

The foregoing paragraphs describe the process transaction flows associated with the Cash-to-Cash Manufacturing Operating Cycle for the fictitious supply chain manager, Manufacturer (OEM). More specifically, these paragraphs describe, step-by-step, how to teach and explain the integration of procure-to-pay, plan-to-produce, and order-to-cash business processes using a purchasing, operations, and supply chain management context. Furthermore, these paragraphs demonstrate experiential, active-learning pedagogy using a hands-on business process integration simulation (BPIsim) that is effective at taking difficult enterprise resource planning concepts and simplifying them so virtually any participant will come away from the simulation more enlightened. In this simulation, participants role-play with tangible products and

learn by hearing and listening, by seeing, and by touching and doing, enabling them to really “connect the dots.”

The Appendix displays a copy of each of the preprinted documents and business forms. These documents are aligned with, and appropriate for, the process transaction flows depicted in Figure 1. The Appendix contains copies of the Sales Order, Packing Slip/Delivery Note, Invoice, Purchase Requisition, Purchase Order, Bill of Materials (BOM), and Production Routing for the affected transactions.

These forms are pre-filled with line-item details corresponding to the “buildable” product chosen for the simulation workshop. The relevant documents, along with other pertinent resources identified in Table 1, are provided to the appropriate team member of the supply chain in order to complete the appropriate transactions as outlined in Figure 1 and described in Sections 3.1-3.4. The participants merely swap documents, exchange cash money, deliver components and subassemblies, and assemble and deliver “buildable” products.

4. ASSESSMENT OF LEARNING EFFECTIVENESS

4.1 Measurement of Change

In assessing the learning effectiveness of the BPI Simulation, an experiment was conducted that included a pretest-treatment-posttest design (Dimitrov, Rumrill, and Phillip, 2003). The pretest-treatment-posttest design involved three steps: 1) administration of a pretest to measure the dependent variable (Y1), the knowledge of the integration of business processes before the treatment; 2) application of the experimental treatment (T), the BPI Simulation; and 3) administration of a posttest to measure the dependent variable (Y2), the knowledge of the integration of business processes after the treatment. Variances attributed to the application of the experimental treatment were then measured and evaluated by comparing the pretest score with the posttest score. In this research, differences (D) represent the gain in scores attributed to the application of the experimental treatment (T) and were evaluated by the equation, $D = Y2 - Y1$.

4.2 Empirical Assessment

The test, employing 30 true-false, multiple choice, and multiple answer questions, was administered immediately prior to and immediately after participating in the simulation. The test included questions on ERP concepts associated with the “Procure-To-Pay Materials Management (MM)” business process, the “Plan-To-Produce Manufacturing Execution (ME)” business process, and the “Order-To-Cash Sales and Distribution (SD)” business process.

Table 3 presents the pretest-posttest data for comparison of three groups (or three class sections of business students) on dependent variable Y. With respect to performance, out of 132 participants, 94 (71.2%) participants received higher scores on the posttest, 10 (7.6%) participants had no change in scores, and 28 (21.2%) participants received lower scores after the simulation.

	Group 1	Group 2	Group 3	Totals
Number of Participants	44	44	44	132
BPI Sim Pretest Score (Points) (Y1)	1,203	1,333	1,259	3,795
Posttest Score (Points) (Y2)	1,570	1,780	1,490	4,840
Gain (Points) Difference D = Y2 – Y1	367	447	231	1,044
Percentage Improvement (%)	30%	33%	18%	28%

Table 3. Pretest-Posttest Data for Comparison of Three Groups on Dependent Variable Y Measurement of Change

Total score is defined as the summation of the individual test scores on a particular test for a relevant group of participants. For instance, for the entire population of 132 participants, the total pretest score was 3,795 points, and the total posttest score was 4,840 points, leaving a gain score of 1,044 points, or a 28% improvement in total performance score after the treatment simulation. The disaggregated performances of the population are as follows:

- Group 1, composed of 44 participants, had a total pretest score of 1,203 points and a total posttest score of 1,570 points, leaving a gain score of 367 points, or a 30% improvement in performance score after the simulation;
- Group 2, also composed of 44 participants, had a total pretest score of 1,333 points and a total posttest score of 1,780 points, leaving a gain score of 447 points, or a 33% improvement in performance score after the simulation; and
- Group 3, likewise composed of 44 participants, had a total pretest score of 1,259 points and a total posttest score of 1,490 points, leaving a gain score of 231 points, or an 18% improvement in performance score after the simulation.

In summary, the empirical findings and results of the pretest-treatment-posttest experiment indicate that participants increased their knowledge of the integration of the key business processes associated with procure-to-pay, plan-to-produce, and order-to-cash processes after participating in the simulation. Moreover, qualitative assessments of written comments from the participants in this simulation found positive effects with virtually all of the respondents supporting the notion that the BPIsim is intuitive, engaging, fun, and highly effective as an experiential learning activity to teach the integration of business processes using enterprise resource planning (ERP) concepts.

5. CONCLUSION

5.1 Summary

Business Process Integration Simulation (BPIsim) is a unique, innovative, engaging, hands-on, interactive pedagogy that employs the “Hear and Listen – See – Do and Touch” methodology to teach the integration of business processes using enterprise resource planning (ERP) concepts. It is an active learning methodology that empowers instructors to teach and engages participants to learn cross-functional business processes that span across multiple supply chain members. The hands-on simulation teaches and reinforces the participant’s knowledge of the Cash-to-Cash Manufacturing Operating Cycle in a purchasing, operations, and supply chain management context. BPIsim is efficient and cost-effective. Moreover, BPIsim takes a complicated subject, and simplifies it so that any participant in any college major can come away from the simulation understanding the integration of procure-to-pay, plan-to-produce, and order-to-cash business processes in a short period of time (about one hour).

5.2 Contributions

Although this manuscript offers a number of contributions, six deserve special mention and are specifically highlighted, herein. First, the paper proposes a simple, yet comprehensive and profound, process framework for teaching, explaining, and learning the integration of the key business processes identified as procure-to-pay, plan-to-produce, and order-to-cash (see Figure 1). Second, the paper provides preprinted documents and forms aligned with all of the key transactions identified in the proposed process framework (see Appendix). Third, the paper creates and proposes a practical, efficient, and effective “teaching” and “learning by hearing and listening, by seeing, and by touching and doing” simulation to meet individual learning needs. Fourth, the current paper proposes a pedagogical simulation that is affordable (less than \$15.00 per five-person team) and scalable (see Sections 2.1 and 2.2). Fifth, unlike previous research that uses two or three members of the supply chain (Shen, Nicholson, and Nicholson, 2015) to

demonstrate the integration of cross-functional business processes, this simulation adds Supplier 2 and Distributor and includes five key members of the supply chain: Supplier 2, Supplier 1, Manufacturer, Distributor, and End-User. Last, but not least, the paper proposes an integrated pedagogical simulation tool that intersects ERP concepts, key business processes, and purchasing, operations, and supply chain management models while providing a teaching and learning design that is flexible, efficient, and broadly applicable for all academics and practitioners.

6. REFERENCES

- Angolia, M. G. & Pagliari, L. R. (2018). Experiential Learning for Logistics and Supply Chain Management Using an SAP ERP Software Simulation. *Decision Sciences Journal of Innovative Education*, 16(2), 104-125.
- Cleary, J. L. (2018). Career Focus: What Employers Want from a Business Analyst? Retrieved March 16, 2018, from <https://mbs.rutgers.edu/articles/career-focus-what-employers-want-business-analyst>.
- Coy, S. P. (2016). Manufacturing Squares: An Integrative Statistical Process Control Exercise. *Decision Sciences Journal of Innovative Education*, 5(2), 285-300.
- Dimitrov, D. M., Rumrill, J., Jr., & Phillip, D. (2003). Pretest-Posttest Designs and Measurement of Change. *Work*, 20(2), 159-165.
- Fedorowicz, J., Gelinas, U. J., Jr., Usoff, C., & Hachey, G. (2004). Twelve Tips for Successfully Integrating Enterprise Systems across the Curriculum. *Journal of Information Systems Education*, 15(3), 235-244.
- Grandzol, C. J. & Grandzol, J. R. (2018). Chantey Castings: A Hands-On Simulation to Teach Constraint Management and Demand-Driven Supply Chain Approaches. *Decision Sciences Journal of Innovative Education*, 16(1), 6-22.
- Jacobs, R. & Chase, R. B. (2018). Distinguishing Operations versus Supply Chain Processes. In *Operations and Supply Chain Management*. (15 ed.), McGraw Hill Education, 4-6.
- Lambert, D. M. & Cooper, M. C. (2000). Issues in Supply Chain Management. *Industrial Marketing Management*, 29(1), 65-83.
- Léger, P. -M. (2006). Using a Simulation Game Approach to Teach Enterprise Resource Planning Concepts. *Journal of Information Systems Education*, 17(4), 441-447.
- Meyer, B. C. & Bishop, D. S. (2016). Stock Control: Learning Inventory Concepts by Beating Levels and Winning Prizes. *Decision Sciences Journal of Innovative Education*, 14(3), 315-336.
- Monczka, R. M., Handfield, R. B., Giunipero, L. C., & Patterson, J. L. (2016). Understanding the Language of Purchasing and Supply Chain Management. In *Purchasing and Supply Chain Management*, (6 ed.), Cengage Learning, 11.
- Padhy, P. C. (2012). Pedagogical Implications: Bridge between Teaching & Learning. *Journal of Business Management & Social Sciences Research*, 1(1), 32-34.
- Reyes, P. M. (2007). Parallel Interaction Supply Chain Game: An Extension of the Beer Game. *Decision Sciences Journal of Innovative Education*, 5(2), 413-421.
- Sarkar, S. & Kumar, S. (2016). Demonstrating the Effect of Supply Chain Disruptions through an Online Beer Distribution Game. *Decision Sciences Journal of Innovative Education*, 14(1), 25-35.
- Seethamraju, R. (2011). Enhancing Student Learning of Enterprise Integration and Business Process Orientation through an ERP Business Simulation Game. *Journal of Information Systems Education*, 22(1), 19-29.
- Shen, Y., Nicholson, J. A., & Nicholson, D. B. (2015). Using a Group Role-Play Exercise to Engage Students in Learning Business Processes and ERP. *Journal of Information Systems Education*, 26(4), 265-280.
- Snider, B. R. & Eliasson, J. B. (2009). Push versus Pull and Mass Customization: A Lego Inukshuk Demonstration. *Decision Sciences Journal of Innovative Education*, 7(2), 411-416.
- Stewart, G. (1997). Supply-Chain Operations Reference Model (SCOR): The First Cross-Industry Framework for Integrated Supply-Chain Management. *Logistics Information Management*, 10(2), 62-67.
- Topi, H. (2019). Invited Paper: Reflections on the Current State and Future of Information Systems Education. *Journal of Information Systems Education*, 30(1), 1-9.
- Umble, E. & Umble, M. (2013). Utilizing a Simulation Exercise to Illustrate Critical Inventory Management Concepts. *Decision Sciences Journal of Innovative Education*, 11(1), 13-21.
- Vaughan, T. S. & Gardner, J. P. (2009). The Sandwich Factory: An In-Class Demonstration of Pull Production Concepts. *Decision Sciences Journal of Innovative Education*, 7(1), 259-263.
- Webb, G. S., Thomas, S., & Liao-Troth, S. (2014). Teaching Supply Chain Management Complexities: A SCOR Model Based Classroom Simulation. *Decision Sciences Journal of Innovative Education*, 12(3), 181-198.
- Whitelock, V. G. (2012). Alignment between Green Supply Chain Management Strategy and Business Strategy. *International Journal of Procurement Management*, 5(4), 430-451.
- Whitelock, V. G. (2015). Environmental Social Governance Management: A Theoretical Perspective for the Role of Disclosure in the Supply Chain. *International Journal of Business Information Systems*, 18(4), 390-405.
- Whitelock, V. G. (2018). Business Analytics and Firm Performance: Role of Structured Financial Statement Data. *Journal of Business Analytics*, 1(2), 1-12.
- Whitelock, V. G. (2019a). From Not-So-Good, to Good, to Great, and Beyond: An Empirical Analysis of an Illustrative Field Example. *Review of Integrative Business & Economics Research*, 8(S2), 333-343.
- Whitelock, V. G. (2019b). Multidimensional Environmental Social Governance Sustainability Framework: Integration, Using a Purchasing, Operations, and Supply Chain Management Context. *Sustainable Development*, 1-8.

AUTHOR BIOGRAPHY

Vincent G. Whitelock is an assistant professor of operations and supply chain management in the management department at the college of business administration at Central Michigan University. He earned his B.A. in psychology and political science from the University of Rochester, M.S. in industrial administration from the Tepper School of Business at Carnegie-Mellon



University, M.B.A. from the college of business and innovation at the University of Toledo, and Ph.D. in manufacturing management and engineering in the college of business and innovation at the University of Toledo. He is a SAP Certified Associate (TERP10 & TS410) in SAP ERP – Integrated Business Processes in SAP S/4Hana, and teaches courses in the areas of strategy, service, operations, purchasing, integrated supply chain management, managerial finance, financial management, applied statistics in business decision making, and micro-computer applications in business. His research interests include supply chain management strategy, green supply chain management strategy, strategic alignment, sustainability, and environmental social governance management. His research activity has resulted in publications in journals including: *International Journal of Business Information Systems*, *International Journal of Procurement Management*, *Journal of Business Analytics*, *Review of Integrative Business & Economics Research*, *Sustainable Development*, and *Journal of Information Systems Education*.

APPENDIX

<p>DISTRIBUTOR / DEALER</p> <p>1 West Main Street His Town, His State</p>	<div style="border: 2px solid black; padding: 5px; display: inline-block;"> <p>Doc. 1</p> </div>	<p>Sales Order</p> <p>Sales Order Number: 0050 Invoice Number: Customer ID:</p>			
<p>THE PURCHASE ORDER NUMBER MUST APPEAR ON ALL RELATED CORRESPONDENCE, SHIPPING PAPERS AND INVOICES</p>					
<p>DISTRIBUTION CENTER: DISTRIBUTOR / DEALER</p> <p>1 West Main Street His Town, His State</p>	<p>SHIP TO: END-USER</p> <p>1 Center Street Her Town, Her State</p>				
Sales Order Number	Order Date	Due Date	Shipped VIA	F.O.B. Point	Payment Terms
0050	January 1, 2018	January 15, 2018	Ground	Destination	Cash/ Debit/ Credit
Quantity	Item Number	Description	Unit Type	Unit Price	Line Total
1	AMV9000	V'S AUTOMOBILE	Each	\$ 45.00	\$ 45.00
1	PNGF1000	POSABLE NEXT GENERATION FIGURE	Each	\$ 5.00	\$ 5.00
2				SUBTOTAL	\$ 50.00
				SALES TAX	Exempt
				SHIPPING AND HANDLING	Included
				OTHER	N/A
				OTHER TOTAL	\$ 50.00
Requested by: _____			Date: _____		
SALES PERSON					
Comments:					
<p>Please contact the Customer Service department at +1.555.555.5555 with any questions or concerns. Thank you for your business!</p>					

DISTRIBUTOR / DEALER		Doc. 2	Packing Slip		
1 West Main Street His Town, His State			Packing Slip Number: 1050		
THE PURCHASE ORDER NUMBER MUST APPEAR ON ALL RELATED CORRESPONDENCE, SHIPPING PAPERS AND INVOICES					
BILL TO: END-USER 1 Center Street Her Town, Her State			SHIP TO: END-USER 1 Center Street Her Town, Her State		
Sales Order Number	Order Date	Invoice Number			Packing Slip Number
0050	January 1, 2018	2050			1050
Order Quantity	Material #	Material Description	Unit Type		Ship Quantity
1	AMV9000	V'S AUTOMOBILE	Each		1.00
1	PNGF1000	POSABLE NEXT GENERATION FIGURE	Each		1.00
2				SUBTOTAL	2.00
				OTHER	N/A
				OTHER TOTAL	2.00
Comments:					
Please contact the Customer Service department at +1.555.555.5555 with any questions or concerns. Thank you for your business!					

DISTRIBUTOR / DEALER

Doc. 3

Invoice

Invoice Number: 2050

1 West Main Street
His Town, His State

THE PURCHASE ORDER NUMBER MUST APPEAR ON ALL RELATED CORRESPONDENCE, SHIPPING PAPERS AND INVOICES

BILL TO:
END-USER
1 Center Street
Her Town, Her State

SHIP TO:
END-USER
1 Center Street
Her Town, Her State

Sales Order Number	Order Date	Invoice Number		Packing Slip Number
0050	January 1, 2018	January 15, 2018		1050

Ship Quantity	Material #	Material Description	Unit Type	Unit Price	Item Total
1	AMV9000	V'S AUTOMOBILE	Each	\$ 45.00	\$ 45.00
1	PNGF1000	POSABLE NEXT GENERATION FIGURE	Each	\$ 5.00	\$ 5.00
				SUBTOTAL	\$ 50.00
				SALES TAX	Exempt
				SHIPPING AND HANDLING	Included
				OTHER	N/A
				OTHER TOTAL	\$ 50.00

Comments:

Please contact the Customer Service department at +1.555.555.5555 with any questions or concerns.
Thank you for your business!

DISTRIBUTOR / DEALER		Purchase Requisition			
1 West Main Street His Town, His State		Doc. 4	Purchase Requisition Number: 5050		
THE PURCHASE ORDER NUMBER MUST APPEAR ON ALL RELATED CORRESPONDENCE, SHIPPING PAPERS AND INVOICES					
VENDOR: MANUFACTURER (OEM) 1 East Main Street Your Town, Your State		VENDOR NUMBER: TAC-0001		SHIP TO: DISTRIBUTOR / DEALER 1 West Main Street His Town, His State	
Purchase Requisition Number	Requisition Date	Req'd Delivery Date	Shipped VIA	F.O.B. Point	Payment Terms
5050	January 1, 2018	January 15, 2018	Ground	Destination	Net 30
Requested Quantity	Material #	Material Description	Unit Type	Unit Price	Item Total
1	AMV9000	V'S AUTOMOBILE	Each	\$ 37.00	\$ 37.00
1	PNGF1000	POSABLE NEXT GENERATION FIGURE	Each	\$ 1.00	\$ 1.00
2				SUBTOTAL	\$ 38.00
				SALES TAX	Exempt
				SHIPPING AND HANDLING	Included
				OTHER	N/A
				OTHER TOTAL	\$ 38.00
Requested by: _____			Date: _____		
Department Representative					
Comments:					
Please contact the Customer Service department at +1.555.555.5555 with any questions or concerns. Thank you for your business!					

DISTRIBUTOR / DEALER	Doc. 5	Purchase Order			
1 West Main Street His Town, His State		Purchase Order Number: 6050			
THE PURCHASE ORDER NUMBER MUST APPEAR ON ALL RELATED CORRESPONDENCE, SHIPPING PAPERS AND INVOICES					
TO: MANUFACTURER (OEM) 1 East Main Street Your Town, Your State		SHIP TO: DISTRIBUTOR / DEALER 1 West Main Street His Town, His State			
Purchase Order Number	P.O. Date	Delivery Date	Shipped VIA	F.O.B. Point	Payment Terms
6050	January 1, 2018	January 15, 2018	Ground	Destination	Net 30
Order Quantity	Material #	Material Description	Unit Type	Unit Price	Item Total
1	AMV9000	V'S AUTOMOBILE	Each	\$ 37.00	\$ 37.00
1	PNGF1000	POSABLE NEXT GENERATION FIGURE	Each	\$ 1.00	\$ 1.00
2					
			SUBTOTAL		\$ 38.00
			SALES TAX		Exempt
			SHIPPING AND HANDLING		Included
			OTHER		N/A
			OTHER TOTAL		\$ 38.00
Authorized by: _____			Date: _____		
Purchasing Manager					
Comments:					
Please contact the Customer Service department at +1.555.555.5555 with any questions or concerns. Thank you for your business!					

MANUFACTURER (OEM)		Doc. 6	Packing Slip	
1 East Main Street Your Town, Your State			Packing Slip Number: 7050	
THE PURCHASE ORDER NUMBER MUST APPEAR ON ALL RELATED CORRESPONDENCE, SHIPPING PAPERS AND INVOICES				
BILL TO: DISTRIBUTOR / DEALER 1 West Main Street His Town, His State		SHIP TO: DISTRIBUTOR / DEALER 1 West Main Street His Town, His State		
Purchase Order Number	P.O. Date	Invoice Number		Packing Slip Number
6050	January 1, 2018	8050		7050
Order Quantity	Material #	Material Description	Unit Type	Ship Quantity
1	AMV9000	V'S AUTOMOBILE	Each	1.00
1	PNGF1000	POSABLE NEXT GENERATION FIGURE	Each	1.00
2			SUBTOTAL	2.00
				OTHER
				N/A
OTHER TOTAL				2.00
Comments:				
Please contact the Customer Service department at +1.555.555.5555 with any questions or concerns. Thank you for your business!				

<p>MANUFACTURER (OEM) 1 East Main Street Your Town, Your State</p>	<div style="border: 2px solid black; padding: 5px; display: inline-block;"> Doc. 7 </div>	<p style="color: red; font-size: 1.2em;">Invoice</p> <p>Invoice Number: 8050</p>																																		
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Ship Quantity	Material #	Material Description	Unit Type	Unit Price	Item Total																															
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1	PNGF1000	POSABLE NEXT GENERATION FIGURE	Each	\$ 1.00	\$ 1.00																															
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<p>Please contact the Customer Service department at +1.555.555.5555 with any questions or concerns. Thank you for your business!</p>																																				

<p>MANUFACTURER (OEM) 1 East Main Street Your Town, Your State</p>	Doc. 8	<p style="color: red; font-size: 1.2em;">Purchase Requisition</p> <p style="color: red; font-size: 0.8em;">Purchase Requisition Number: 5050</p>			
THE PURCHASE ORDER NUMBER MUST APPEAR ON ALL RELATED CORRESPONDENCE, SHIPPING PAPERS AND INVOICES					
<p>VENDOR: SUPPLIER 1 1 North Main Street Any Town, Any State</p>	<p>VENDOR NUMBER: TAC-0001</p>	<p>SHIP TO: MANUFACTURER (OEM) 1 East Main Street Your Town, Your State</p>			
Purchase Requisition Number	Requisition Date	Req'd Delivery Date	Shipped VIA	F.O.B. Point	Payment Terms
5050	January 1, 2018	January 15, 2018	Ground	Destination	Net 30
Requested Quantity	Material #	Material Description	Unit Type	Unit Price	Item Total
1	FB1000	FRONT BLOCK	Each	\$ 2.35	\$ 2.35
1	FC1000	FRONT CONNECTOR	Each	\$ 1.50	\$ 1.50
1	MB1000	MIDDLE BLOCK	Each	\$ 2.30	\$ 2.30
1	RC1000	REAR CONNECTOR	Each	\$ 1.50	\$ 1.50
1	RB1000	REAR BLOCK	Each	\$ 2.35	\$ 2.35
5				SUBTOTAL	\$ 10.00
				SALES TAX	Exempt
				SHIPPING AND HANDLING	Included
				OTHER	N/A
				OTHER TOTAL	\$ 10.00
Requested by: _____ Department Representative			Date: _____		
Comments:					
Please contact the Customer Service department at +1.555.555.5555 with any questions or concerns. Thank you for your business!					

MANUFACTURER (OEM) 1 East Main Street Your Town, Your State	Doc. 9	Purchase Order Purchase Order Number: 6050			
THE PURCHASE ORDER NUMBER MUST APPEAR ON ALL RELATED CORRESPONDENCE, SHIPPING PAPERS AND INVOICES					
TO: SUPPLIER 1 1 North Main Street Any Town, Any State	SHIP TO: MANUFACTURER (OEM) 1 East Main Street Your Town, Your State				
Purchase Order Number	P.O. Date	Delivery Date	Shipped VIA	F.O.B. Point	Payment Terms
6050	January 1, 2018	January 15, 2018	Ground	Destination	Net 30
Order Quantity	Material #	Material Description	Unit Type	Unit Price	Item Total
1	FB1000	FRONT BLOCK	Each	\$ 2.35	\$ 2.35
1	FC1000	FRONT CONNECTOR	Each	\$ 1.50	\$ 1.50
1	MB1000	MIDDLE BLOCK	Each	\$ 2.30	\$ 2.30
1	RC1000	REAR CONNECTOR	Each	\$ 1.50	\$ 1.50
1	RB1000	REAR BLOCK	Each	\$ 2.35	\$ 2.35
5				SUBTOTAL	\$ 10.00
				SALES TAX	Exempt
				SHIPPING AND HANDLING	Included
				OTHER	N/A
				OTHER TOTAL	\$ 10.00
Authorized by: _____ Purchasing Manager			Date: _____		
Comments:					
Please contact the Customer Service department at +1.555.555.5555 with any questions or concerns. Thank you for your business!					

<p>SUPPLIER 1 1 North Main Street Any Town, Any State</p>	<p>Doc. 10</p>	<p>Packing Slip Packing Slip Number: 7050</p>			
<p>THE PURCHASE ORDER NUMBER MUST APPEAR ON ALL RELATED CORRESPONDENCE, SHIPPING PAPERS AND INVOICES</p>					
<p>BILL TO: MANUFACTURER (OEM) 1 East Main Street Your Town, Your State</p>	<p>SHIP TO: MANUFACTURER (OEM) 1 East Main Street Your Town, Your State</p>				
Purchase Order Number	P.O. Date	Invoice Number	Packing Slip Number		
6050	January 1, 2018	8050	7050		
Order Quantity	Material #	Material Description	Unit Type	Ship Quantity	
1	FB1000	FRONT BLOCK	Each	1.00	
1	FC1000	FRONT CONNECTOR	Each	1.00	
1	MB1000	MIDDLE BLOCK	Each	1.00	
1	RC1000	REAR CONNECTOR	Each	1.00	
1	RB1000	REAR BLOCK	Each	1.00	
5			SUBTOTAL	5.00	
				OTHER	N/A
OTHER TOTAL				5.00	
Comments:					
Please contact the Customer Service department at +1.555.555.5555 with any questions or concerns. Thank you for your business!					

SUPPLIER 1		Doc. 11		Invoice		
1 North Main Street Any Town, Any State				Invoice Number: 8050		
THE PURCHASE ORDER NUMBER MUST APPEAR ON ALL RELATED CORRESPONDENCE, SHIPPING PAPERS AND INVOICES						
BILL TO: MANUFACTURER (OEM) 1 East Main Street Your Town, Your State			SHIP TO: MANUFACTURER (OEM) 1 East Main Street Your Town, Your State			
Purchase Order Number		P.O. Date		Invoice Number		
6050		January 1, 2018		January 15, 2018		
					Packing Slip Number	
					7050	
Ship Quantity		Material #	Material Description	Unit Type	Unit Price	Item Total
1		FB1000	FRONT BLOCK	Each	\$ 2.35	\$ 2.35
1		FC1000	FRONT CONNECTOR	Each	\$ 1.50	\$ 1.50
1		MB1000	MIDDLE BLOCK	Each	\$ 2.30	\$ 2.30
1		RC1000	REAR CONNECTOR	Each	\$ 1.50	\$ 1.50
1		RB1000	REAR BLOCK	Each	\$ 2.35	\$ 2.35
5						
SUBTOTAL						\$ 10.00
SALES TAX						Exempt
SHIPPING AND HANDLING						Included
OTHER						N/A
OTHER TOTAL						\$ 10.00
Comments:						
Please contact the Customer Service department at +1.555.555.5555 with any questions or concerns. Thank you for your business!						

MANUFACTURER (OEM) 1 East Main Street Your Town, Your State	Doc. 12	<b style="color: red;">Purchase Requisition Purchase Requisition Number: 5050			
THE PURCHASE ORDER NUMBER MUST APPEAR ON ALL RELATED CORRESPONDENCE, SHIPPING PAPERS AND INVOICES					
VENDOR: SUPPLIER 2 1 South Main Street My Town, My State	VENDOR NUMBER: TAC-0001	SHIP TO: MANUFACTURER (OEM) 1 East Main Street Your Town, Your State			
Purchase Requisition Number	Requisition Date	Req'd Delivery Date	Shipped VIA	F.O.B. Point	Payment Terms
5050	January 1, 2018	January 15, 2018	Ground	Destination	Net 30
Requested Quantity	Material #	Material Description	Unit Type	Unit Price	Item Total
4	BB1000	BREMBO BRAKE	Each	\$ 0.75	\$ 3.00
4	WTA1000	WHEEL TIRE ASSEMBLY	Each	\$ 3.00	\$ 12.00
1	RT1000	ROOF TOP	Each	\$ 3.00	\$ 3.00
1	PNGF1000	POSABLE NEXT GENERATION FIGURE	Each	\$ 1.00	\$ 1.00
10					
				SUBTOTAL	\$ 19.00
				SALES TAX	Exempt
				SHIPPING AND HANDLING	Included
				OTHER	N/A
				OTHER TOTAL	\$ 19.00
Requested by: _____			Date: _____		
Department Representative					
Comments:					
Please contact the Customer Service department at +1.555.555.5555 with any questions or concerns. Thank you for your business!					

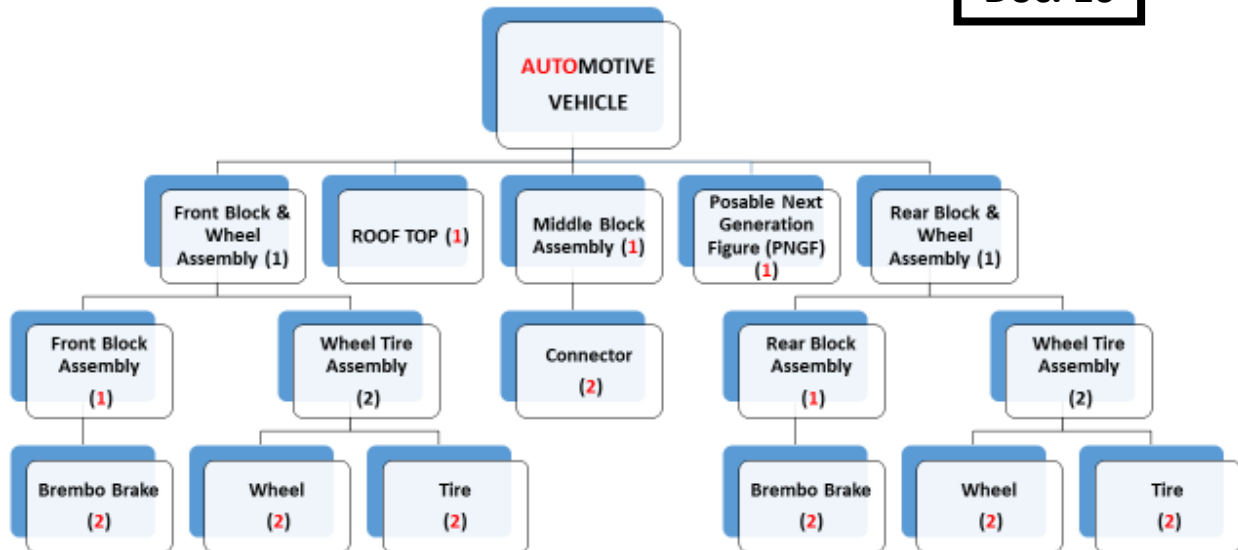
MANUFACTURER (OEM) 1 East Main Street Your Town, Your State	Doc. 13	<b style="color: red;">Purchase Order Purchase Order Number: 6050			
THE PURCHASE ORDER NUMBER MUST APPEAR ON ALL RELATED CORRESPONDENCE, SHIPPING PAPERS AND INVOICES					
TO: SUPPLIER 2 1 South Main Street My Town, My State	SHIP TO: MANUFACTURER (OEM) 1 East Main Street Your Town, Your State				
Purchase Order Number P.O. Date Delivery Date Shipped VIA F.O.B. Point Payment Terms					
6050 January 1, 2018 January 15, 2018 Ground Destination Net 30					
Order Quantity Material # Material Description Unit Type Unit Price Item Total					
4	BB1000	BREMBO BRAKE	Each	\$ 0.75	\$ 3.00
4	WTA1000	WHEEL TIRE ASSEMBLY	Each	\$ 3.00	\$ 12.00
1	RT1000	ROOF TOP	Each	\$ 3.00	\$ 3.00
1	PNGF1000	POSABLE NEXT GENERATION FIGURE	Each	\$ 1.00	\$ 1.00
10			SUBTOTAL		\$ 19.00
			SALES TAX		Exempt
			SHIPPING AND HANDLING		Included
			OTHER		N/A
			OTHER TOTAL		\$ 19.00
Authorized by: _____ Purchasing Manager			Date: _____		
Comments:					
Please contact the Customer Service department at +1.555.555.5555 with any questions or concerns. Thank you for your business!					

<p>SUPPLIER 2 1 South Main Street My Town, My State</p>	<p>Doc. 14</p>	<p>Packing Slip Packing Slip Number: 7050</p>		
THE PURCHASE ORDER NUMBER MUST APPEAR ON ALL RELATED CORRESPONDENCE, SHIPPING PAPERS AND INVOICES				
<p>BILL TO: MANUFACTURER (OEM) 1 East Main Street Your Town, Your State</p>	<p>SHIP TO: MANUFACTURER (OEM) 1 East Main Street Your Town, Your State</p>			
Purchase Order Number	P.O. Date	Invoice Number	Packing Slip Number	
6050	January 1, 2018	8050	7050	
Order Quantity	Material #	Material Description	Unit Type	Ship Quantity
4	BB1000	BREMBO BRAKE	Each	4.00
4	WTA1000	WHEEL TIRE ASSEMBLY	Each	4.00
1	RT1000	ROOF TOP	Each	1.00
1	PNGF1000	POSABLE NEXT GENERATION FIGURE	Each	1.00
10			SUBTOTAL	10.00
			OTHER	N/A
			OTHER TOTAL	10.00
Comments:				
Please contact the Customer Service department at Phone: +1.973.442.9444 with any questions or concerns. Thank you for your business!				

<p>SUPPLIER 2 1 South Main Street My Town, My State</p>	<p>Doc. 15</p>	<p>Invoice Invoice Number: 8050</p>			
<p>THE PURCHASE ORDER NUMBER MUST APPEAR ON ALL RELATED CORRESPONDENCE, SHIPPING PAPERS AND INVOICES</p>					
<p>BILL TO: MANUFACTURER (OEM) 1 East Main Street Your Town, Your State</p>	<p>SHIP TO: MANUFACTURER (OEM) 1 East Main Street Your Town, Your State</p>				
Purchase Order Number	P.O. Date	Invoice Number	Packing Slip Number		
6050	January 1, 2018	January 15, 2018	7050		
Ship Quantity	Material #	Material Description	Unit Type	Unit Price	Item Total
4	BB1000	BREMBO BRAKE	Each	\$ 0.75	\$ 3.00
4	WTA1000	WHEEL TIRE ASSEMBLY	Each	\$ 3.00	\$ 12.00
1	RT1000	ROOF TOP	Each	\$ 3.00	\$ 3.00
1	PNGF1000	POSABLE NEXT GENERATION FIGURE	Each	\$ 1.00	\$ 1.00
10				SUBTOTAL	\$ 19.00
				SALES TAX	Exempt
				SHIPPING AND HANDLING	Included
				OTHER	N/A
				OTHER TOTAL	\$ 19.00
Comments:					
Please contact the Customer Service department at +1.555.555.5555 with any questions or concerns. Thank you for your business!					

Bill Of Material (BOM)

Doc. 16



Production Routing – Tangible Automotive Vehicle		
Operation Number	Operation Description	Doc. 17
00.	Stage Material	
01.	Enclose Posable Next Generation Figure (PNGF) into specified Container	
02.	Insert Connector into Front Block, with logo “A” facing up	
03.	Attach Middle Block to Connector on Front Block	
04.	Insert Connector into Middle Block, with logo “A” facing up	
05.	Attach Rear Block to Connector on Middle Block	
06.	Screw-on Brembo Brake to Threaded Axle on Block Assemblies – (4x)	
07.	Attach Wheel Tire Assembly to Axle, on Block Assemblies – (4x)	
08.	Attach Roof Top to the Middle Block	
09.	Inspect Assembled 3-D Vehicle (Use Finger to Spin Wheels – (4x))	
10.	Pack Assembled 3-D Vehicle and PNGF into specified Packaging	
11.	Move Packaged 3-D Vehicle & PNGF to designated Storage Location	



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