

## Notes and Debates

## Purchasing process models: Inspiration for teaching purchasing and supply management

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## ABSTRACT

Most scholars of purchasing and supply management (PSM) are familiar with some form of a purchasing process model (PPM). A PPM is the visual representation of the sequence of activities that constitute purchasing and supply management. Such a visual representation can be a tool in teaching PSM since it gives students an overview of an otherwise intangible process. Moreover, a PPM can also be viewed as a representation of the identity of PSM, providing a schema of what is PSM (and what it is not). In this notes and debates article, a systematic overview of different types of PPMs, and their evolution, is presented, based on a literature review and a survey, with the models being classified as tactical/operational, strategic, cyclical, or decision-making processes. Our first aim is to inspire PSM scholars and educators when they are considering various PPMs to be used in their teaching of PSM. Our second aim is to debate the question where the evolution of PPMs is heading and explore whether a single holistic model can provide an accurate and representative framework to structure purchasing activities both today and in the future.

## 1. Introduction

Purchasing and Supply Management (PSM)<sup>1</sup> has come into the spotlight as an important (van Weele and van Raaij, 2014), strategic (Cousins et al., 2008), and critical business activity (Wynstra et al., 2019) to deal with a multitude of stakeholders in multi-tier supply networks (Choi and Krause, 2006). The practice, identity, and evolution of PSM as an academic and practical field requires us to answer several important questions. What is purchasing and what does it consist of? And what is it not? In order to teach this complex profession that consists of a multitude of activities to students, we need to define what is included in the purchasing process. This is often done by explicating and visualizing a purchasing process model (PPM). In this article, a PPM is defined as the visual representation of the sequence of activities that constitute purchasing and supply management.

Organizations in practice use PPMs to help standardize, monitor and control their purchasing activities. With clearly defined PPMs, organizations can explain to their employees what purchasing is and how it

should be conducted in that specific organization. PPMs also help employees to quickly grasp the main purchasing processes and activities and can be used for problem-solving and decision-making (March, 2006). While these organization-specific PPMs are of great help for practitioners, educators need a more generic approach when teaching and potentially require several models to represent a wider range of purchasing situations. However, as of yet, there is no comprehensive overview of PPMs that could be used for teaching, in part because several models that the community is well acquainted with are originally presented in grey literature or language-specific publications (e.g., the Purchasing Excellence framework, Monczka et al., 2016; NEVI, 2002).

The choice of a particular PPM in teaching also transmits a signal of identity: it provides a schema of what PSM is (and what it is not). This means that an evolving identity of PSM over the last 25 years should also be reflected in an evolution of PPMs. Since the 1990s, we have witnessed a trend of firms focusing on their core competences and outsourcing all activities that other organizations can execute against

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more favorable conditions, such as lower cost, higher quality, or higher levels of flexibility (Prahalad and Hamel, 1990; Quinn and Hilmer, 1994). As a consequence of such far-reaching make-or-buy decisions, it is not uncommon for a modern industrial firm to spend more than half of its turnover on goods and services purchased from suppliers (van Weele and van Raaij, 2014). Supply chains have become more fragmented and more global, with higher levels of supply risk (Bode and Wagner, 2015), placing purchasing in a more strategic role in many firms (Carter and Narasimhan, 1996; Cousins et al., 2008b; Spina et al., 2013). PSM as a field of study has evolved significantly over the last 25 years, claiming a seat in the C-suite in many firms (Johnson et al., 2006) as well as board level presence in public organizations (Glock and Broens, 2013).

We, the authors, grew up with certain PPMs in our own education in purchasing and/or supply chain management and started to use PPMs when we became educators ourselves. At first, we employed the PPMs offered in PSM textbooks without questioning (see e.g. Cousins et al., 2008a; Leenders et al., 2006; Lysons and Farrington, 2006; Monczka et al., 2002; van Weele, 1996). As our exposure to different PPMs grew, we started to compare models, use different models for different purposes, combine models to compensate for the limitations of several models, and develop some PPMs of our own. Research questions emerged as we started to discuss these models: Do PPMs look different now as compared to the past? Are some models more frequently used than others? Can we observe an evolution of PPMs over time? PSM education needs to prepare students to cope with current and future requirements of PSM (Henke et al., 2016) and our use of PPMs has to evolve accordingly. In a current trend report (SILF, 2018), the Swedish Purchasing and Logistics Association found that “attracting and developing competence” was the fastest rising trend, moving from being ranked 23rd in 2017 to 9th in 2018.

PPMs can be used as a boundary object (Spee and Jarzabkowski, 2009) between the teacher and the students in order to aid the transfer and translation of knowledge (Carlile, 2004) and to create awareness and understanding (Buckler, 1996). PPMs may thus serve various functions, depending on the topic that is taught (e.g., PSM vs. Operations Management), the background of the students (engineering vs. business), and the specific application (small vs. large purchases, products vs. services, standard vs. customized products). For instance, the process for buying services will most likely differ from the one for buying goods (Lindberg and Nordin, 2008; Van der Valk and Rozemeijer, 2009), while the process of buying customized Engineer-to-Order (ETO) materials will probably differ from buying standard Make-to-Stock (MTS) materials (Wikner and Bäckstrand, 2018).

The aim of this article is to explicate the use of PPMs by academics and educators, in order to delineate and summarize the current models in use, inspire educators to use one or more models, and set the stage for development in the use of PPMs for future purchasing contexts and professionals. This article is concerned with the issue of how we can teach PSM to the purchasers of tomorrow with the help of process models. We used multiple research methods to move beyond our own experience and build a collection of PPMs. The following section describes our methodology. Then, we discuss the results and develop a structured overview of the PPMs. Finally, we discuss the implications of this research, look towards the future of PSM and PSM education, and raise questions for debate.

## 2. Building the collection

We set out to identify PPMs used in education by employing a mixed-methods approach guided by the PRISMA structure for transparent reporting of systematic reviews (see Fig. 1). First, we will introduce our survey of academics and educators concerning the PPMs they use in education. Second, we will discuss the methodology of the structured literature review to identify PPMs in the literature.

In order to identify PPMs, a web-based questionnaire was developed

and distributed through an online survey system to PSM educators all over the world (Chen, 2016). In the survey, we asked the respondents to upload a picture or other file containing the PPM included in their teaching. We also asked about the source (book, paper, author) for each model, and some of the characteristics of the model. We also asked them in which type of class they use this model to teach. The respondents could repeat these steps for multiple models, if they use more than one. As an incentive for participation we offered the respondents a copy of the results.

As the aim was to survey what PPMs are used in teaching across the globe, we created a manageable sample that covered as many educational institutions and published authors from the PSM field as possible. The sampling frame was created from a systematic literature review of PSM research (Suurmond et al., 2015). Specifically, a list with authors and institutions was extracted from the bibliographic database of 2,472 PSM articles from 1996 to 2014 created by Suurmond et al. (2015). The sampling frame for this survey consisted of the most recent author for each institution that had contributed at least one article in that database. Prolific authors were added to this initial list, namely those with three or more articles in the database. In total, 1,070 authors were identified using these two sampling methods. We then sent out the survey to these authors and managed to reach 1,020 people from 56 different countries in three weeks. The response rate of the survey was 22.45% (229), and the completion rate was 10.59% (108).

Note that this sample consists of PSM authors, rather than educators. The set of authors published by the top journals is not equivalent to the population of PSM educators that we targeted. However, most PSM researchers (and definitely their institutions) will also teach courses in PSM, although not always in English. To ensure we targeted the right person from each institution, we asked targeted authors to nominate a colleague within their institution if they deemed that person more eligible to answer the survey.

In addition to the sample identified from the systematic literature review, we added a convenience sample consisting of educators in the field, that is, our extended network, and asked them to complete the survey as well.

Resulting from the web-survey, 66 files containing PPMs were uploaded by 48 respondents. Ten of these models were self-developed by the respondent specifically for educational purposes. The remainder of the respondents did not upload a file, in part due to the fact that they do not use a PPM in their teaching, see Fig. 1.

Furthermore, we explored PPMs in existing PSM literature by searching relevant keywords in Google Scholar, Emerald, and ScienceDirect. The keywords for the search included ‘purchasing’ or ‘buying’ or ‘procurement’ and ‘process’ or ‘model’ or ‘activities.’ By going through the identified articles, we searched for visual representations of purchasing processes as well as discussions that describe the purchasing process as a multistep procedure. For those articles mentioning a purchasing process, we used the snowballing technique and went through the references in order to find related articles that might include more PPMs. We also gathered models from PSM textbooks (both academic and nonacademic) in our personal literature archives since several models have been developed by practitioners and do not appear in academic literature. However, we did not specifically target or include models presented by practice-focused institutions (such as ISM, CIPS, IFPSM, CAPS, NEVI) unless the models were used by educators in PSM education. The literature review and keyword search led to the discovery of 34 identified PPMs.

The total set of 100 PPMs were assessed for *eligibility* and models not matching our definition – ‘a visual representation of the main tasks, activities and processes that constitute purchasing and supply management’ – were excluded, e.g. purchasing maturity models that do not represent the steps in a particular buying situation (van Weele, 2018, p. 72). Also, PPMs published in a language other than English were omitted. The sample was then *screened*, and duplicates (within the web-survey results as well as between the web-survey and the literature

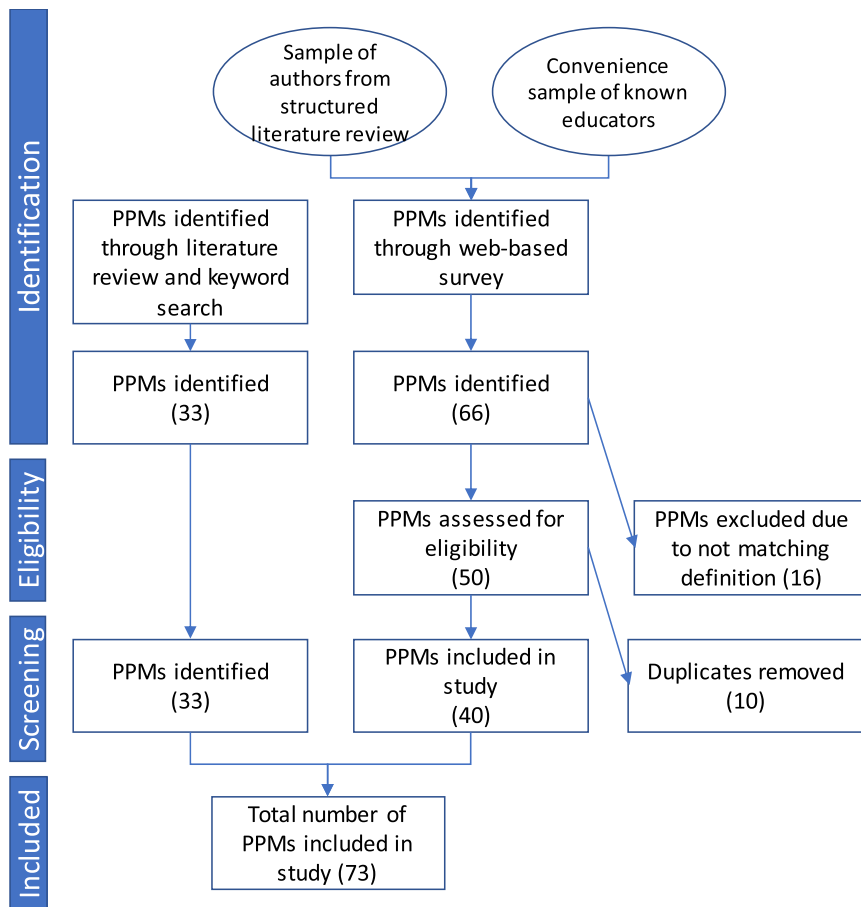


Fig. 1. Structure for the systematic review, based on Moher et al. (2009).

review) were removed. After filtering out these non-PPMs and consolidating identical designs, 73 unique PPMs were identified and included in the study. See Appendix A for the full list of included PPMs.

### 3. A structured overview of purchasing process models

In this section, we discuss a selection of PPMs discovered during the literature review and survey. We created a systematic overview of the various models by examining the characteristics of each model. The models are presented in chronological order to see the development over time, while the characteristics of the different models, according to our categorization, are summarized in Table 1. Please note that the definition used by the original source is used for determining if the model covers an operational, a tactical or a strategic level. Also note that the order is based on when the model was first presented, not its most recent publication.

The early models present the purchasing process as a (detailed) decision-making process or emphasize various decision-making units. Later, more sequential and linear models of the purchasing process have

been presented. Then, several authors proposed models representing more strategic and higher-level PSM processes. Others proposed the process as a cycle, rather than a linear sequence – where the start and the end of the process are connected – or as a hybrid, combining linear and cyclical parts. These different types of models will be introduced next.

This section is concluded with an overview of the different models illustrating the maturation, or at least the evolution, of the models over time. We can thus identify areas of further development.

#### 3.1. Decision-making process models

Some models have been proposed that consider the decision-making process of purchasing. For example, Rados (1970) proposed a view of the purchasing process as a series of questions (see Fig. 2). Other models in this category emphasize the flow of information and decisions in the purchasing process (Schill, 1978), while still others emphasize that decisions are made by various people (decision-making units) in a company, such as a model of the main stakeholders and their

Table 1  
Summary of the aspects covered by different PPMs.

	Rados (1970)	van Weele (1996)	Dobler and Burt (1996)	Monczka (1999)	Monczka et al. (2002)	Johnsen et al. (2014)	Bäckstrand (2014)	van Raaij (2016)
Buying decision	x	x	x				x	x
Sourcing		x	x	x	x	x	x	x
Supplier management			x	x	x	x		x
Continuous process					x	x	x	x
Includes supplier exit							x	

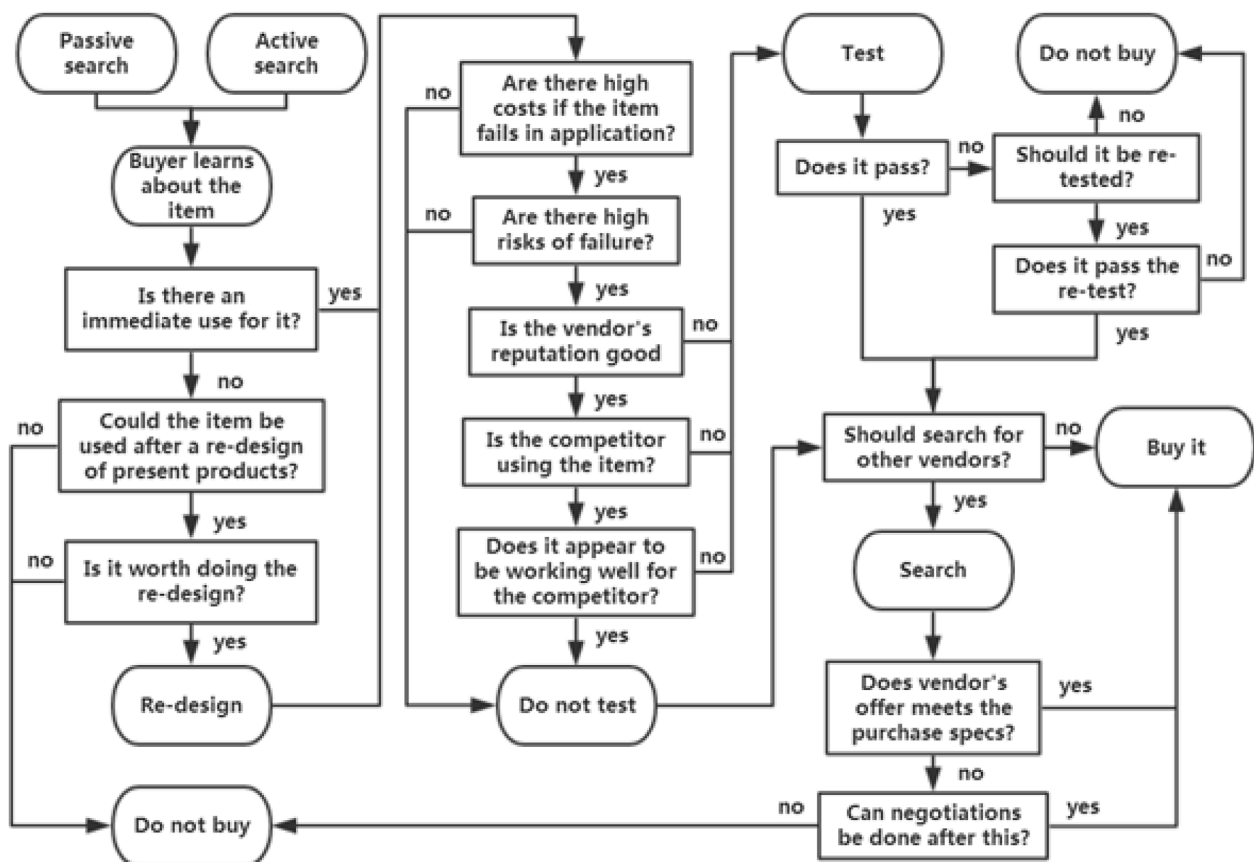


Fig. 2. A decision-making process model. Reproduced with permission of Emerald, from Rados (1970, Exhibit 1, p. 12).

interactions during a purchasing process (Palmer et al., 1996) and the PPM for small purchases using a purchasing card (Parikh and Joshi, 2005). Another perspective shows the purchasing process as a decision tree starting with a Make-or-Buy decision and ending with the post-purchase performance evaluation (Coyle et al., 2003). Early models, like the one by Rados (1970), depicted in Fig. 2, appear to serve the purpose of explaining what purchasing is to an audience that has not yet heard of that responsibility before.

### 3.2. Linear process models

In our sample, the majority of models propose purchasing as a linear process (41 out of 73) and of the 66 uploaded PPMs, 12 were identical representations of van Weele's purchasing process, as presented in the textbook *Purchasing and Supply Chain Management* (van Weele, 1996, 2000, 2002, 2005, 2010, 2014, 2018). Another 6 were designed or adopted based on it. Hence, this model will be used to represent the linear models. The model proposes purchasing as a linear sequence of six steps, divided into a tactical part (specification, selection, and contracting) and an operational part (ordering, monitoring and evaluation) as seen in Fig. 3.

Other linear models propose a process with fewer steps (Lysons and Farrington, 2006) or more steps (e.g. Brown and Brucker, 1990; Leenders et al., 2006; Novack and Simco, 1991). Others adapted the model to serve a specific purpose, such as buying business services (Van der Valk and Rozemeijer, 2009). We also note that early designs of PPMs are sketchy and less detailed. Often, these early models depict the purchasing process as a linear process consisting of between four and eleven steps (see e.g. Abratt, 1986; Bellizzi and Belonax, 1982; Lilien and Wong, 1984; Stock and Zinszer, 1987; Webster Jr, 1965; Woodside and Samuel, 1981).

In our survey we asked the respondents when they had started using

a PPM in their teaching and we can trace the use of van Weele's model back to 1988 when it was adopted in the Netherlands, Belgium and Sweden. Notably, this was eight years before the first English language edition of Van Weele's textbook was published, suggesting that translated versions of the Dutch language model featured in PSM education programs beyond the Dutch speaking countries. We also asked the respondents where the model was currently used and discovered that among the 27 adopters, some 12 countries in Europe, North America and Africa were represented.

Other linear models locate the traditional PPM by van Weele as embedded in the firm's activities and strategies (e.g., the "race car" model as published in Heijboer (2003)) or show both strategic activities and tactical purchasing processes (e.g. Dobler and Burt, 1996).

The model by Dobler and Burt (1996) in Fig. 4 includes different levels of processes, ranging from activities with a strategic focus to activities with a tactical/operational focus. The tactical/operational purchasing activities are part of the procurement activities, which are in turn part of the supply management activities. This model emphasizes the hierarchical nature of PSM processes (much akin to a nesting matryoshka Russian doll). Materials management is positioned as a separate process in the model.

Most PPMs in our set are linear process models. These models typically communicate that purchasing starts with a problem or a request (from an internal customer) and finish with a purchased and delivered solution. In that sense, purchasing is depicted as a more tactical and operational problem-solving process. The model by Dobler and Burt (1996) is the only one with an explicit embedding of PSM in more strategic considerations of the organization.

### 3.3. Strategic process models

Some PPMs address purchasing at a more strategic level. Most



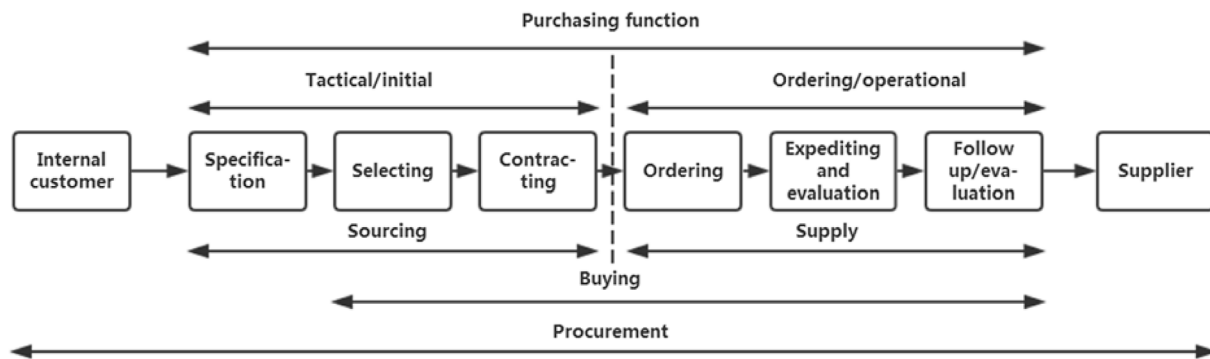


Fig. 3. A linear process model. Reproduced with permission of Arjan van Weele from Van Weele (2018, Figure 1.2, p. 9).

prominent among these is the Purchasing Excellence Framework developed at Michigan State University with the Dutch Association for Purchasing Management (NEVI, 2002) by Monczka (1999) (see Fig. 5). This model has not appeared often in published form but has been disseminated through practice and is well known in the academic community and replicated in textbooks such as Axelsson et al. (2005, p. 5) and van Weele (2018, p. 169). This model does not consider any of the tactical steps discussed in Van Weele. Instead, it discusses how purchasing can become an integrated, aligned and global part of the overall firm strategy through strategic action. This model focusses much more on the long-term process of designing purchasing policy, rather than conducting an actual purchase.

### 3.4. Cyclical process models

A linear PPM may be sufficient for project-related or other one-off purchasing items. However, few purchases start from a blank page. The purchasing organization usually has experience buying the kinds of materials and services they need, and they usually have some knowledge about the suppliers on the market. This is information that can and should be used in the purchasing situation. Accordingly, models that highlight the cyclical aspect of purchasing have been proposed where, after the sequence of steps has ended, the process starts again for a

future purchase.

This is captured, for example, in the PPM by Monczka et al. (2002) (see Fig. 6). It shows how the evaluation of supplier performance leads to identification and anticipation of future material and service needs.

We also identified a PPM originally developed and used by IBM Consulting (Buter and Loa, 2008), that is referred to as the “Extended purchasing process model” by van Weele (2014, p. 43; 2018, p. 33) and used as the basis for the PSM process wheel by van Raaij (2016, p. 14). The PSM process wheel, as published in van Raaij (2016), combines strategic, tactical, and operational activities (see Fig. 7). In the outer ring, the strategic and tactical activities result in a category sourcing strategy and contracts with one or more suppliers for that purchase category. The contract is the start of the operational activities, which generate invoices. The invoices are input for the spend analysis (as one of the sourcing analyses). The inner ring defines the supply base management activities that are seen as strategic. Taken together, the inner and outer ring specify what PSM entails.

Other cyclical models include the CIPS Procurement Cycle (2018), the health-care contracting cycle by Clark et al. (1995), a multi-cycle PPM (de Boer, 1998), and the double cycle of strategic planning and tactical contracting in health-care contracting by Duran et al. (2005).



Fig. 4. A purchasing chart. Reproduced with permission of Mc-Graw Hill Education, from Dobler and Burt (1996, p. 37); permission conveyed through Copyright Clearance Center, Inc..

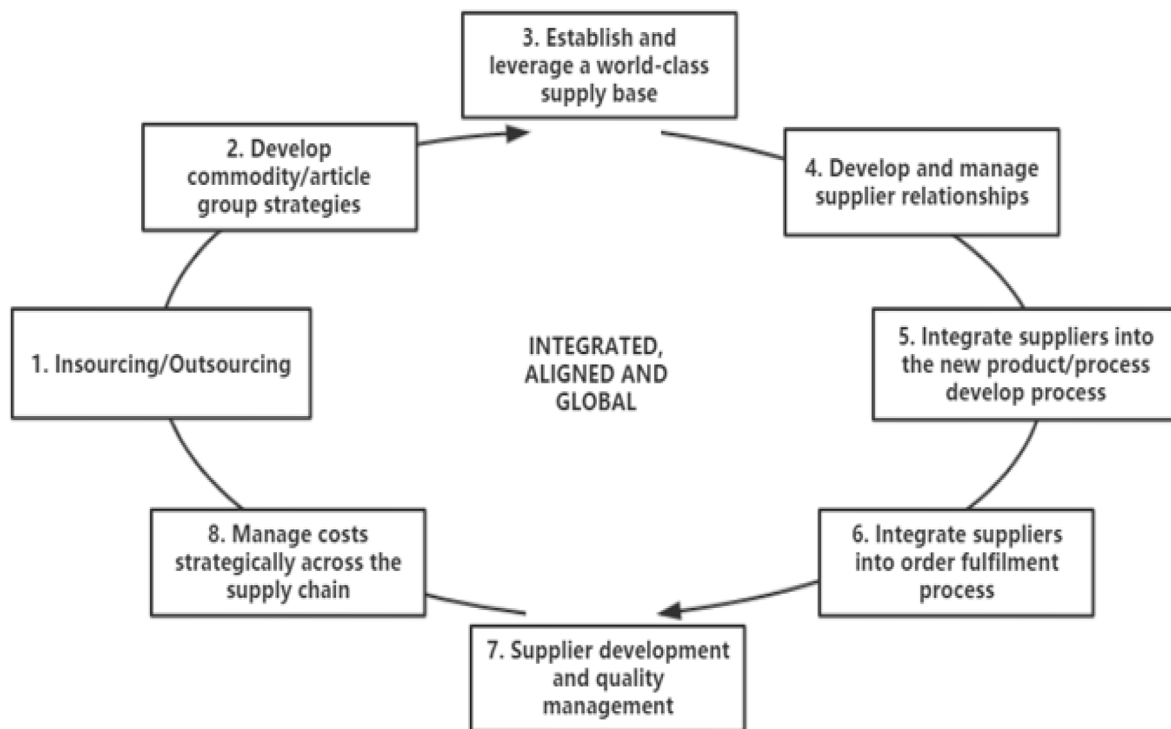


Fig. 5. A strategic process model, based on Monczka (1999). Reproduced with permission of NEVI, source: NEVI, 2002.

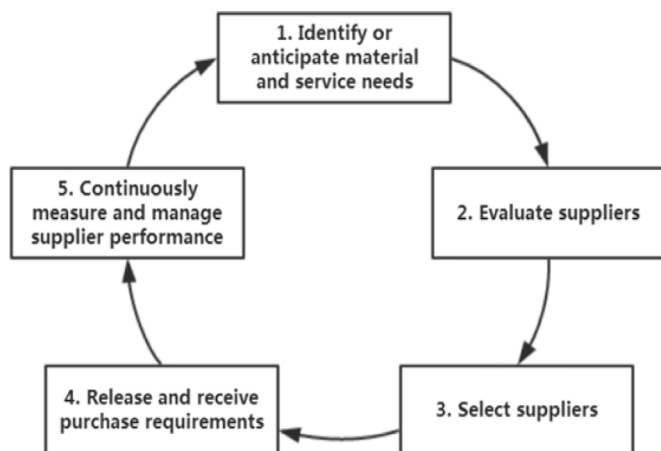


Fig. 6. A cyclical process model. Reproduced with permission of Cengage Learning SO, from Monczka et al. (2002, Exhibit 2.2, p. 29); permission conveyed through Copyright Clearance Center, Inc..

### 3.5. Hybrid Linear–Cyclical process models

Another model, inspired by Nokia and presented by Johnsen et al. (2014, p. 31), divides the purchasing stages based on the status of suppliers (see Fig. 8). Visually, the process is organized as a combination of two parallel streams of subprocesses and one cycle. Once a supplier is approved and becomes a preferred supplier, it is managed continuously in terms of its performance, development, and its relationship with the buying company. The cyclical part of this model is hence identical to the inner circle of Fig. 7. Concerning new suppliers, they need to first pass the pre-evaluation and go through the selection process in order to become approved suppliers.

This model separates the activities for searching and selecting new suppliers from the activities for managing existing suppliers. The model also indicates that finding new suppliers is a one-off linear process, whereas managing the current supply base is a continuous process with

long-term orientations.

A self-developed process model, designed specifically for educational purposes, is here represented by the Interaction Life Cycle model by Bäckstrand (2014). This hybrid model is based on the Plan-Do-Check-Act (PDCA) cycle where the planning stage for a new purchase is extended as a linear process to include the exposure of a need, the exploration of different alternatives for fulfilling this need (e.g., a Make-or-Buy decision) and the initial election to purchase (see Fig. 9). If the best way to fulfil a need is a purchase, the Plan stage is initiated. The purchase is carried out in the Do stage and is followed up in the Check stage. The Act stage offers four different alternatives: (a) Echo - If it is a straight rebuy based on the current contract, execute another purchase; (b) Evolve - If the contract needs to be altered, the Plan stage will be revisited; (c) Exit - If the product is no longer needed, the supplier relation is terminated, and the supplier is terminated; (d) Exchange - If the product is still needed, but the current supplier cannot deliver according to agreed levels, the supplier is exchanged for another supplier and the linear Sourcing stage is revisited. This process model also regards the time dimension by stating which steps in the process should be carried out at different stages of the product life cycle (Hayes and Wheelwright, 1979).

### 3.6. Summary

In total, our survey and literature review discovered 73 distinct PPMs, see Appendix A for the full list. In this article, we have visualized eight of them and illuminated the differences between them. Table 1 provides a summary of how these eight PPMs compare. Over time, there appears to be a development from models that emphasize the operational buying decision, to models that integrate buying, sourcing and supplier management. One striking insight from this comparison is that supplier exit is included in only one of these eight models. Not one of these eight PPMs integrates all five aspects: buying, sourcing, and supplier management in a continuous process including supplier exit.

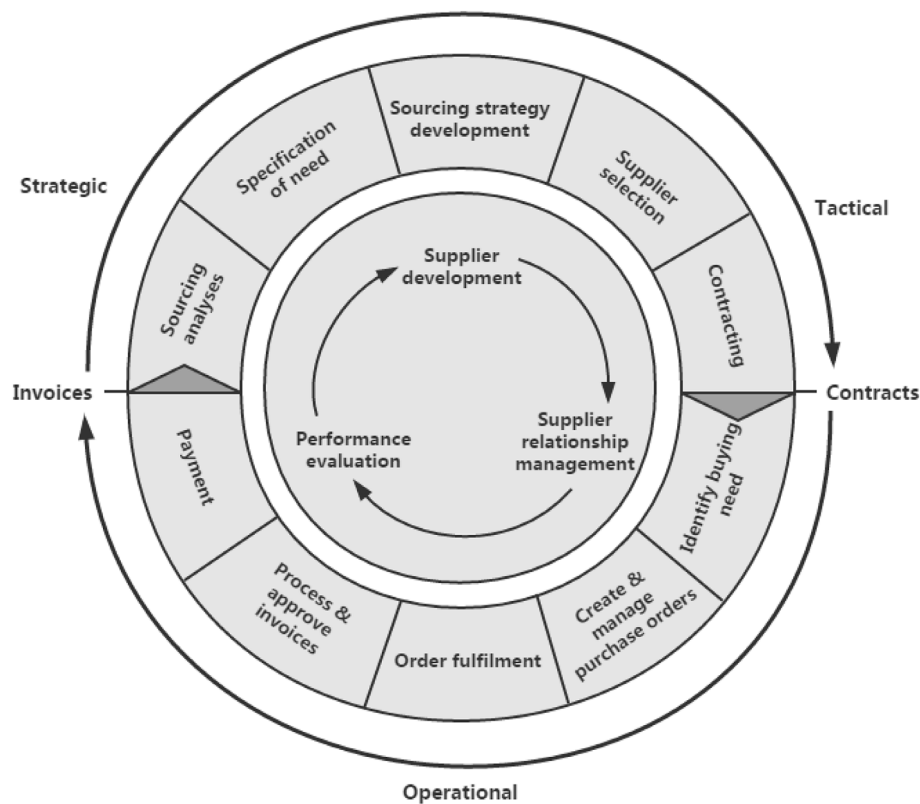


Fig. 7. The PSM process wheel (van Raaij, 2016).

#### 4. Quo vadis?

Through our survey and literature review we identified 73 distinct purchasing process models. According to our study, the model that has spread the widest and has been adopted most in academia is the PPM by van Weele. In this model, the purchasing process is divided into several sequential steps and modeled linearly. Other models that have been proposed since van Weele's model was first published in English in 1996 differ mainly in three dimensions. First, some models discuss PSM processes at an abstract, more strategic level. Second, some models emphasize that purchasing is a continuous cycle, rather than a linear process. Finally, some models emphasize that, even though purchasing

is a continuous process, the individual supplier relation might be terminated through supplier exit. Our overview helps to identify and delineate multiple potential models for use by educators.

When we started this endeavor to collect available PPMs, we had hopes of identifying one integrated PPM fit for all educational purposes. As it turns out, a single PPM is not available, and may not even be desirable, as the field of purchasing is pluralistic and people from various organizational and disciplinary backgrounds are involved in both teaching and carrying out the practice. Still, efforts could be exerted to develop a PPM based on a hierarchical and modular design – inspired by the model of Dobler and Burt (1996) – where “switching” modules on and off and zooming in and out from strategic to

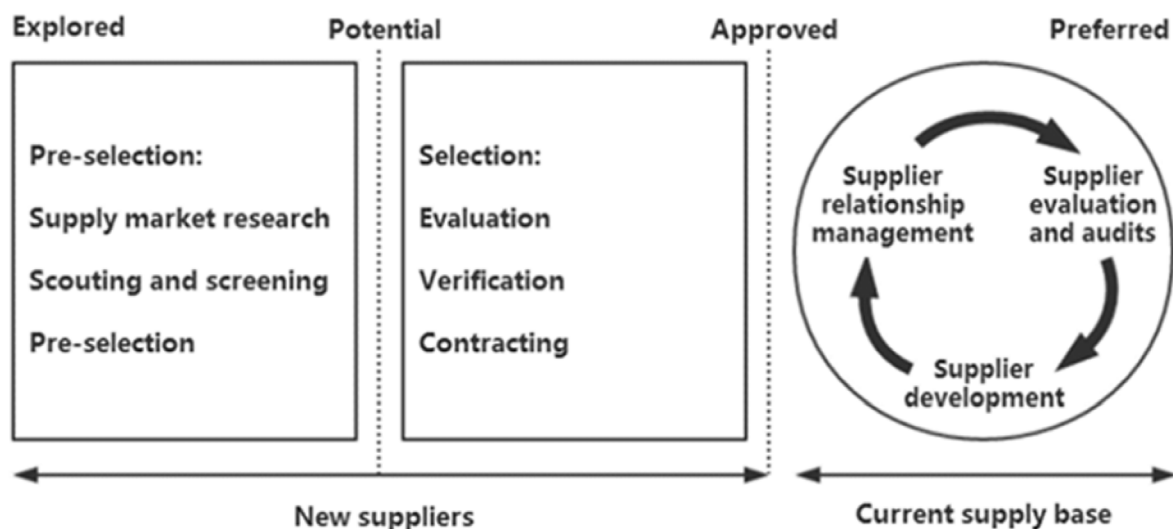


Fig. 8. A PPM centered on supplier status. Reproduced with permission of Taylor & Francis Informa, from Johnsen et al. (2014, Figure 2.2, p. 31); permission conveyed through Copyright Clearance Center, Inc..

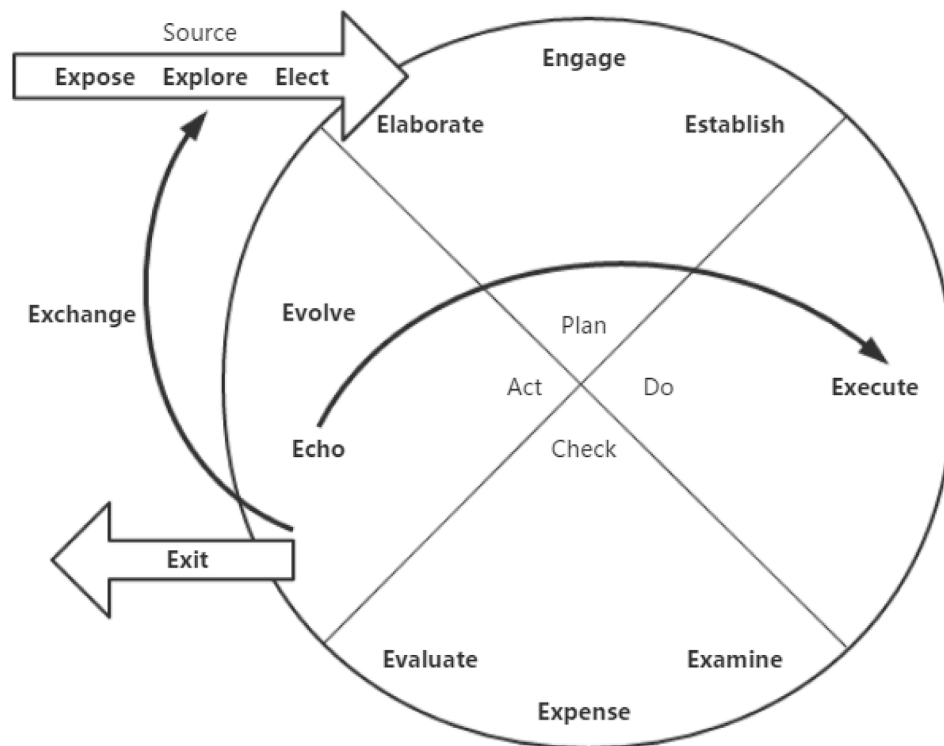


Fig. 9. Interaction life cycle model (Bäckstrand, 2014).

operational activities could make such a model applicable to small and large purchases, to frequent and infrequent purchases, and to the purchase of both physical goods and services.

For teaching our students, an explicit aim could be to prepare them for a variety of jobs, including core responsibilities in purchasing in different types of organizations, industries, contexts, and countries. This may require different PPMs for different purposes. A single model may also not be desirable for teaching various levels of students. In our experience, teaching purchasing in an undergraduate general supply chain management course involves more ‘beginner’ or ‘tactical’ models, whereas teaching purchasing in specialized advanced purchasing-only courses may require exposure to various models to comprehend the breadth of activities that purchasing managers have to deal with in practice. Are our current models sufficiently diverse to account for this pluralistic nature of purchasing?

The vast majority of the models use ‘purchasing vocabulary’, such as “expediting and evaluation” (van Weele, 2018) or “order fulfillment” (van Raaij, 2016), indicating closeness between academia and practice in the field of PSM. However, in the interaction life cycle model presented in Fig. 9 more general terms are used and the model is clearly based on the PDCA-cycle (Deming, 1982) that stems from another academic discipline. Is there a need to link purchasing models to more general management models in order to engage scholars and educators beyond the PSM arena?

PPMs also appear to be evolving over time. For example, some PPMs identified in textbooks evolve from one edition to the next (e.g. Lyons and Farrington, 2006, 2012; van Weele, 2010, 2014). Overall, textbook models expand their scope over time, to include more activities and apply to a myriad of purchasing contexts. This could be indicative of purchasing’s expanding scope and influence within organizations. It probably is also indicative of an evolution of the demarcation of purchasing as that what purchasers do, to purchasing as a responsibility of actors with various function titles.

One interesting finding is the lack of exit strategies included in PPMs. Only one of the eight highlighted models include supplier exit. Within the total set of 73 models, only a handful include such a step,

with labels like “contract termination”, “decision to drop supplier”, “remove the relationship” or “supplier elimination”. A lack of explicit attention to supplier exit seems to suggest that such a step need not to be managed by PSM professionals. Recent research has shown, however, that unmanaged supplier exit might lead to shortage of supply, operational disruptions, dysfunctional relationships, ‘bad will’ or negative market attention (Chen et al., 2016; Habib et al., 2019; Pinnington and Ayoub, 2019). Tahtinen and Halinen (2002) also noted that it is only towards the latter part of the 1990s that publications on relationship endings occurred, and then more in marketing related journals.

Are our PPMs future proof? Individual steps in the model can be executed by people, functions, or departments, but increasingly also by computers or algorithms. As indicated above, early PPMs are functional-oriented and focus just on the purchasing department. Hence, the process of paying suppliers is traditionally not included in PPMs, but obviously it is an important activity in the procure-to-pay process, even if payment is conducted by the finance department. Similarly, some activities might already be automated, but this is not indicated in any of the PPMs. According to both scenarios in a report on the future of PSM (Knight and Meehan, 2018), most sourcing decisions will become automated, including activities formerly regarded as strategic and (wo) man-made. Activity-based representations of PSM also better align with purchasing issues such as maverick buying, in which any organizational member performs (some) purchasing activity, often without knowledge of the department responsible. We expect future models to follow this trend in the evolution of purchasing to an activity-based understanding, but what does this mean for further development?

PSM scholars and educators can use this overview of PPMs for inspiration with regard to their education. More than half of the respondents of our survey state that they do not use any PPM in teaching, even though they teach subjects such as PSM, operations management, and strategic sourcing. Our overview can certainly provide inspiration to these respondents, and to PSM educators in general. Our overview can also be used to consider using more than one model in teaching PSM. Several respondents already use more than one model. For



example, one model can help students perceive the strategic purchasing process (e.g., Monczka, 1999), while a second one can provide the tactical and operational steps of actually conducting a purchase (e.g., van Weele, 2018). We emphasize that no single model will ever be applicable to all purchasing processes, and therefore, we recommend using various models, especially in educational contexts.

Several questions remain to be answered. For example, in this notes and debates article, we examined only what students learn during their education, but we could not examine which models are actually in use in practice by organizations. We have thus taken the perspective of scholarship of education rather than the scholarship of application (Boyer, 1990). Future research could examine which models practitioners use in practice to structure their purchasing processes – are they at all aligned with what we teach? Also, we have studied *what* models are used in the classroom, but we could not study *how* they are used in terms of the pedagogy. Future research could address this question and study if these models are taught as reified PSM knowledge, or as a basis for critical discussion. Future research may also consider the design of new PPMs. For example, our respondents indicated that no models are available specifically for public procurement and only some for buying business services (Lindberg and Nordin, 2008; Van der Valk and Rozemeijer, 2009). There is room for further research into whether PPMs need to be modified for different applications, and if so, how they might be modified. As an example of what such future research could uncover, the International Handbook of Public Procurement (Thai,

2009) presents three PPMs for public procurement, as used in practice by The World Bank (Leipold et al., 2009), the German Federal Ministry of the Interior (Essig et al., 2009), and the government of Uganda (Basheka, 2009).

The question for further research then is this: Are we providing our students with the skills needed to understand and practice PSM, and with the capacity to continuously develop those skills further? Based on the models we uncovered in the literature and in textbooks, as well as the models submitted by educators, we do not yet see adequate attention being paid to the aspects of digitization and automation in our field.

Our overview and analysis of PPMs hopefully inspires current and future generations of PSM educators to build, further develop, and use visual representations of the purchasing process for future-proofing our student communities for jobs in purchasing and supply (chain) management. As we continue to debate the identity and evolution of the purchasing profession and academic field, the process models we employ provide signals for the further development of our field. Our search for and the systematic overview of PPMs for PSM education has already influenced the breadth of models employed in our teaching and we hope it similarly inspires yours!

### Declaration of competing interest

The authors declare that there is no conflict of interest.

## Appendix A

### PPMs found in the literature review

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11	McWilliams, Naumann, and Scott (1992). Determining buying center size. In: <i>Industrial Marketing Management</i> 21.1, pp. 43–49
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21	Baily, Farmer, Crocker, Jessop, and Jones (2008). <i>Purchasing Principles and Management</i> (10th ed.). Harlow, UK: Prentice Hall., pp. 6-7
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23	Parikh and Joshi (2005). Purchasing process transformation: restructuring for small purchases. In: <i>International Journal of Operations &amp; Production Management</i> 25.11, pp. 1042–1061.
24	Leenders (2006). <i>Purchasing and Supply Management: With 50 Supply Chain Cases</i> . London, UK, McGraw-Hill/Irwin, pp.61-62
25	Kakouris, Polychronopoulos, and Binioris (2006). Outsourcing decisions and the purchasing process: a systems-oriented approach. In: <i>Marketing Intelligence &amp; Planning</i> 24.7, pp. 708-729
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29	Monczka, Handfield, Guinipero, Patterson, and Waters (2010). <i>Purchasing &amp; supply chain management</i> : Boston, MA, Cengage Learning EMEA, p. 33
30	Lysons and Farrington (2012). <i>Purchasing and Supply Chain Management</i> (8th ed.). London: Prentice Hall., p. 4
31	CIPS (2018). <i>Procurement and Supply Cycle</i> . URL: <a href="https://www.cips.org/en/knowledge/">https://www.cips.org/en/knowledge/</a>
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3	Schmid, B.F. (1993). Elektronische märkte [Electronic Markets, in German]. In: <i>Wirtschaftsinformatik</i> 35(5): 465–480. Gebauer, J. (1996). <i>Internet-based EDI</i> (CITM Briefing Paper, 96-BP-001). Berkeley, CA: Fisher Center for Management and Information Technology, University of California at Berkeley
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8	Chopra, S., and Meindl, P. (2007). <i>Supply Chain Management: Strategy, Planning, and Operation</i> (3rd International ed.). Upper Saddle River, New Jersey: Pearson Prentice Hall.
9	Self-developed teaching material
10	Self-developed teaching material based on Monczka, Trent, Handfield and van Weele
11	Keough, M. (1993). Buying Your Way to the Top. In: <i>The McKinsey Quarterly</i> (3).
12	Leenders, M. R., Johnson, P. F., Flynn, A. E., and Fearon, H. E. (2006). <i>Purchasing and supply management: with 50 Supply chain cases</i> (13th ed.). London: McGraw-Hill.
	<i>Cyclical models</i>
13	Self-developed teaching material – the Netherlands (Twente)
14	Based on Monczka (1999) and van Weele (2018) p. 169
15	Schroeder, R.G. and Meyer-Goldstein, S. (2019) <i>Operations Management in the Supply Chain</i> , McGraw-Hill, 7th edition
16	Adapted from Johnsen, T., Howard, M., and Miemczyk, J. (2014). <i>Purchasing and supply chain management: A sustainability perspective</i> : Routledge. p. 31
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28	Adapted from Perrotin, R., and de Brugièrre, F. S. (2007). <i>Le manuel des achats: Processus, management, audit</i> . Editions Eyrolles. [in French]
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	<i>Other</i>
33	Based on text in Monczka, R. M., Handfield, R. B., Guinipero, L. C., Patterson, J. L., and Waters, D. (2010). <i>Purchasing &amp; supply chain management</i> : Cengage Learning EMEA
34	Based on van Weele, A. J. (2010). <i>Purchasing and Supply Chain Management: Analysis, Strategy, Planning and Practice</i> (5th ed.). Sydney, AU: Cengage Learning EMEA, p 197
	<i>Adapted from van Weele</i>
35	Adapted from van Weele, A. J. (2018). <i>Purchasing and Supply Chain Management</i> (7th ed.): Cengage Learning EMEA.) p.28 and in text
36	Adapted from van Weele
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