ISSUES WITH INTRODUCING GENERIC OPTIMIZATION MODELS INTO SMEs IN SUB-SAHARAN AFRICA

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ABSTRACT

Small and Medium Enterprise (SMEs) play a vital role in the sustainable industrial development of the Sub-Saharan Africa (SSA). SMEs can benefit from use of productivity and efficiency enhancement optimization models. Even the simplest mathematical model application has the potential to help SMEs promote their competiveness and sustainable growth. The application of optimization models has a proven supportive role in streamlining strategic and operational planning processes. This paper discusses conceptually the feasibility and problems of applying generic optimization methods in the operational planning of SMEs in the SSA nations. This will increase the awareness of SME entrepreneurs of how simple optimization models can help SMEs' improve their efficiency and effectiveness in scarce resources utilization activities. The paper develops generic optimization models with the topologies of suitable applications' modes operandi. Practical application will be subject to further research.

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KEYWORDS: Small and Medium Enterprises (SMEs), Economic Development Optimization Models, Sub-Saharan Africa, Decision Sciences, Production Planning

INTRODUCTION

Small and Medium Enterprise (SMEs) are major contributors to the sustainable industrial development process of emerging nations. The current accelerated advancement of information and electronic technology has made available a variety of user-friendly quantitative models' application software packages. In fact, SMEs in industrialized nations have continued improving their operational efficiency by applying appropriate mathematical (quantitative) models to planning and decision making processes. SME entrepreneurs in developing nations, like those in the Sub-Saharan Africa (SSA), should also benefit from the appropriate use of vastly available resources and productivity optimizing quantitative tools. Even the simplest mathematical model has potential to contribute towards promoting competiveness and growth. This is a wake-up call for SMEs' entrepreneurs in SSA nations to help their firms apply at least proven generic optimization models to help them to improve and enhance their strategic and operational planning process. SMEs operating in any environment can achieve competitiveness, sustainable growth and profitability if they engage in continuous improvement of their operational activities. This is a notable contribution to innovation and sustainable industrial development.

This paper presents a simple and application friendly resource optimization model called Production Plan Optimization (PPO). From an economic rationality point of view, the paper discusses the potential benefit of PPO for firm efficiency improvement endeavours. If SMEs in SSA apply appropriate optimization models, they can improve their efficiency and effectiveness in scarce resources utilization. Application of optimization models is a formidable task particularly in nations with a classical developing economy. However, using simple models can contribute to the optimal utilization efforts. Stakeholders need to be aware that even the simplest model can help if it is adapted to the objective realities on the ground. Thanks to the mushrooming of electronic technology, even in remote villages of Africa, special and general purpose computers are widely available in the SSA nations. Therefore, SMEs should use optimization models in their vital operational activities like production planning and scheduling, etc.

LITERATURE REVIEW

Society's need for goods and services has continued to grow, especially in countries where the population growth rate is high. However, economically valuable resources are always scarce, and this scarcity has created the need for efficient use of resources at hand. This is more apparent in developing nations as they suffer from wide spread scarcity of resources. In fact, they are mostly inclined to use resource optimization methods (Eid, 2009; Dutta and Sinha, 1994; Bazaraa and Bouzaher, 1981;White et al, 2011; Madu, 1999; Bazaraa, and Bouzaher, 1981; Salaheldin and Eid, 2007; Anderson, Sweeny and Williams, 1998). In the industrialized countries the use of optimization models has become popular particularly among SMEs (Yousef, 2011; White, 2011; Jingura, 2009). This is due to a widespread availability of modern, affordable and user-friendly software packages (Yousef, 2011).

Optimization models have been widely used as supporting tools in industrialized countries. The application level is extensive in both private and public socio-economic sectors such as agriculture, industry, environment, health and energy (Garnett et al, 2011; Verhaeghe, Kfir 2002; Denton and Gupta, 2003; Chattopadhyay, 2001; Hashimoto, Romero and Mantovani, 2003; Piper and Vachon, 2001; Caixeta-Filho, Van Swaay-Neto and De Padua, 2002; Dutta, and Sinha, 1994; Miller, Nemhauser and Savelsbergh, 2003, Stapleton, Hanna and Markussen, 2003; Begen and Puterman, 2003). This phenomenon is apparent in economic success stories of developed and East Asian tiger nations (Aghezzaf, and Artiba, 1998; Schaller, Erenguc and Vakharia, 2000; Buehlmann, Zuo and Thomas, 2004). SMEs have extensively applied optimization models as tools to streamline their operational tasks and make sound decisions. This helped them improve the efficiency and effectiveness of their operational activities (Guillaume et al, 2011; Michael Cesar, 2010; Hodges, 1970; Farashahi, 1974; Kasana, 2003; Hiller, Mark and Gerald, 2001; Hoppe and Spearman, 2001; Altinel, Özcan, Yilmaz, Güneş, 2001).

The application of optimization models in SSA nations is in the embryonic stage despite attempts by some researchers and practitioners to apply optimization models (Cabraal, 1981; Maatman, Schweigman, Ruijs, and van Der Vlerk, M., 2002). The application of most of optimization models' focuses on non-manufacturing sectors (Fong, 1980; Bazaraa, Bouzaher, 1981; Cabraal, 1981; Gori, 1996; Madu, Christian,1999; Maatman, Schweigman, Ruijs, and van Der Vlerk, 2002; Gilbert, E., (2003); Kazuhiko, 2003). Optimization model application in SMEs has been nominal and mainly concentrated in branches and subsidiaries of foreign multinational corporations (Naudé, 2010;_Fong, 1980; Cabraal, 1981; Caixeta-Filho, et al, 2002). Still there is a perception in SSAs that optimization models can only be applied bigger companies. However, we can adjust model applications and their results to fit in to a particular situation (Yousef, 2011; Naudé, 2010; Zimmermann, 1994, Ignizio and Tom, 1994). SMEs, particularly smaller ones, can be suitable for the application of optimization models as their production processes are simple and traceable and they produce few products. Unfortunately, this is not the case with SMEs in Sub-Saharan African (SSA) nations. They have failed to benefit from the use of optimization models (Bazaraa, and Bouzaher, 1981). SMEs have a strong representation in SSA nations (Tesfayohannes, 1998). In South Africa, SMEs account for more than 35% of all manufacturing firms (South African Institute Race Relations Report, 1999). They are a prime source of employment generation, innovation and industrial development. Therefore, successful application of optimization models in SMEs is an important contribution to the sustainable industrial development of SSA nations.

METHODOLOGY OF APPLYING OPTIMIZATION MODELS IN PRODUCTION PLANNING

As a supportive precondition for the application of optimization models, I formulated a topological specification system that helps classify and group variables in a given operational planning process (Horngren, Foster, Datar, and Teall, 2000; Chase, Jacobs, and Aquilano, 2004; Heizer, Jay and Render, Barry, 1999). I assume there can be a variety of production variables as inputs. The analysis Starts with three major inputs in a production process of a typical small manufacturing firm. These major inputs are: Available Machine Hours, Available Labor Hours and Required Direct Materials. The objective is to minimize direct production costs by optimizing the use of these vital inputs in a given production process (Salaheldin and Eid, 2007; Foulds, 1981; Gupta and Mohan, 1989). SMEs can conveniently apply simple optimization model for smoothing production process. I shape the model to suit production system specifications. Accordingly, I formulated typological specifications processes intended to identify operational characteristics and production systems of manufacturing firms. This is to obtain required knowledge about the following important features: the relationship between the production plan and the production process; the objectives and decision variants of production plan; the objective realities and peculiarities of the decision variables for which optimal result is searched; the necessary information for operational planning models and detailed data that should be obtained from a solution of an optimization model. The typological specification process as shown in Table 1 is meant for SMEs engaged in manufacturing activities with obviously limited production lines.

Table 1: Characteristics of Production Processes

1. Basic Forms of production Process	2. Plant Layout System	3. Production Process System	4. Technological Standard	5. Cost Accounting System
A. Extraction Process *B. Conversion Process* *C. Fabrication (or formation) Process* *D. Assembly Process* *E. Hybrid or Mixed Process*	*A. Layout by Process* *B. Layout by product* C. *Mixed Layout System*	*A. Continuous Production System* *B. Intermittent Production System*	*A. Labor Intensive Production System* B. *Capital Intensive Production System*	*C. Job order Costing System* *D. Process Costing System*

Source: Designed by author

A) Extraction Process indicates the process of raw and basic material extraction (depletion) from natural reserves. B) Conversion Process demonstrates the process of changing chemical contents of materials. For example, changing iron ore into metal sheets, or making ingredients into one combined output. (E.g. chemical processing plants). C) Fabrication (or Formation) Process refers to the process of transforming materials physically that is changing them into some specific forms as desired. For example, furniture plants, textiles, and many others. D) Assembly Process refers to fixing parts together to give them specific formation and function. Examples include assembling a fender to a car, assembling tires to a bicycle. E) Hybrid or Mixed Process referring to using more than one production process systems at the same time.

Layout is the arrangement of production facilities on industrial premises. The three basic types of layout for basic production system are: A) Layout by Process (Functional layout): all operations of a similar nature are grouped together in the same department or production centre of the given factory. For example, there may be separate areas for drilling operations, milling, grinding, and fitting. B) Layout by Product: This means, the arrangement of production facilities in line with the needs of the product and sequence of the operations system that is necessary for engaging in a manufacturing activity. Layout by product is particularly suitable for continuous production system that is used to producing a small range of goods in very large quantities (mass production). C) Mixed Layout System: Some industries use both Lay Out by Process and Lay Out by Product Systems simultaneously. In particular, larger firms that produce varieties of products may find it necessary to arrange their production facilities using both process and product layout systems. There are other layout systems, but for small industries in a developing economy and less technological advancement, these layouts systems are sufficient.

The production process system refers to the firm's production process flow. There are four types of process flows: Job Shop, Batch, Assembly Line, and Continuous. However, they are more or less grouped into two major production process systems: A) Continuous Production System which is suitable for mass production industries such as cement processing, brewery, refinery, etc. Once adopted a continuous production system remains active for a long time. A change in production systems means investing a large capital outlay. The machines available are special purpose machines. B) Intermittent Production System is usually applied in manufacturing industries that produce a variety of products at a time, (or finite number of products in batches to fulfill a customer order).

Technological standard wise, the production process is largely dependent on human labor as labor intensive or hardware technologies such as automated machining, material handling and industrial robots as capital intensive. This technological standard is categorized as labor or capital intensive: (A) Labor Intensive Production Process is usually used by small manufacturing industries that produce simple and mostly consumer goods. In this system, the use of expensive and special purpose machines is low. The role of human labor in the production process is dominant. (B) Capital Intensive Production Process applies to manufacturing industries engaged in mass production activities and use modern, expensive and highly specialized as well as largely automated machines.

The costing system of manufacturing industries is based on the type of production system used. Generally there are two basic costing systems: A) Job Order Costing System is the application of costs to specific jobs in terms of single physical unit or a few similar units (such as a dozen of chairs). Units are identified by individual codes or batches. Job order costing system is applicable in industries like construction, garment factories, furniture manufacturing, metal tools fabricating and printing. B) Process Costing System is used by firms manufacturing standard products for stock in a continuous flow, without reference to specific orders or lots. Emphasis is placed on production for a given period such as a day, a week or a month. A process costing system applies to industries like flourmills, breweries, cement plants, chemical plants, sugar factories, paper factories, textile mills, food processing and others.

Based on the above typological specifications, I characterize the operational activities' framework of a given manufacturing firm. For example, a plant can be characterized as: engaged in material conversion, (1B); arranged according to product layout system (2B); apply a continuous production system, (3A); use capital intensive production process, (5B); apply process costing system (5B).

The typological specification process is a prerequisite for determining the following basic structures of constraints: labor hours constraints based on occupational (or qualification groups) and structural units; material resource constraints based on material type and structural units; machine hours constraints based on types of machines and average operational capacity; minimum allowed production volume (level of demand); and the average standstill and waiting time in production process.

MODEL ESTABLISHMENT PROCESS

I assume that the annual production plan is the base for formulating the optimization model. In line with this approach, I determine the major elements of the production plan to identify and analyze production plan related problems in the production planning process. I may face problems during the process of: identification of the factors of production; determination of the objective function; determination of resources inputs used for production; and determination of the potential constraints that are used in the application of optimization models. The most difficult job is to sort out: machines according to their models, types and operational capacity; materials according to their type and quality; and labor force according to qualification and occupation. In the process of problem analysis, I should be aware of the specific stages (or centers) of production process in which the inspection or a test is performed. I also ensure that idle periods such as set-up, repair or operators rest time, etc and others are reduced to determine the net daily operational hours.

The general formulation of optimization a model for firms capable of producing more than one product is presented below. Consider a plant that produces product uj , where $j = 1,2,....,n$. u_j is defined as the quantities of product j . The constraints for our model are limited to the direct inputs comprising the major costs of production: *Machine Hours*, *Labor Hours* and *Direct Materials*. Their optimal utilization has a considerable impact on the cost of each product. The maximum projected sales during a given time duration is a constraint. There are other constraints, but as a first attempt, I considered only influential constraints. The decision on constraints for the optimization model related to production planning are based on a specific manufacturing activity for a given firm. I formulated tabular formats for data collection and determination of net available resources. To determine net available machine hours, we deduct all causes of machine idleness. The mathematical presentation is:

$m_{wj'}$ $w = 1, 2,..., z$
$j = 1, 2, ..., n$

m_{wj}' is the necessary machine time in hours of w^{th} machine group (type) for the j^{th} product. Therefore: M_w is the sum of the net available machine time for w^{th} machine group. The most important task is to

$$\sum_{j=1}^{n} m_{wj} u_j \leq M_w \quad w = 1,2,3,\ldots z$$

collect the necessary data for the computation of the available operational machine time in hours. I designed and made ready formats for use in the data collection purpose.

Our second constraint is direct material. These parts are easily traceable to the finished products in an economically feasible manner. Examples of these are sheet steel for metal industries, wood for furniture industries, cotton for textile, etc. Direct materials do not include indirect materials. Indirect materials are minor items and their tracing cost is excessive and unfeasible. The mathematical presentation is:

f_{ij} ---- $i= 1,2,...,r$ and $J= 1,2,...,n$

f_{ij} is the necessary quantity of i^{th} type of direct material for each product j. Therefore:

$$\sum_{j=1}^{n} f_{ij} u_j \leq F_i \qquad i = 1,2,\ldots,r$$

F_i is the grand total of the available direct material resources of i^{th} type of material. I designed tables that are intended for data collection purpose.

The labor time used in the production process is direct and indirect. Direct labor is all labor that can be identified in an economically feasible manner with the production of finished goods. It is a variable part of the production cost. For example, the labor of machine operators and assemblers is recognized as direct. However, indirect labor is not generally traceable to specific products. I therefore consider the direct labor as our third constraint. The mathematical presentation is:

$x_{sj'}$ $s= 1,2,...,t$
$J=1,2,...,n$

x_{sj} is the necessary direct labor hour(s) of s^{th} qualification (occupational) group to process a unit of j^{th} product.

$$\sum_{j=1}^{n} x_{sj} u_j \leq X_s \qquad s = 1,2,...,t$$

X_s is the grand total of the net available direct labor time in hours for the s^{th} qualification group. I designed tables, for data collection purpose. It is assumed that labor hours and machine hours depend on each other as a machine cannot run without an operator and vice versa.

The maximum level of production for a planned year d_j is determined based on the forecasted level of sales for that year. The minimum production level e_j reflects the *Economic Production Quantity* (EPQ). That is the minimum quantity a plant must produce in order to achieve a reasonable production cost leading to breakeven. If a plant produces lower than the EPQ, the result is higher production cost (due to a higher proportion of fixed cost per unit). This leads to unsustainable business survival.

FORMULATION OF THE OBJECTIVE FUNCTION

Formulating a practical objective function is a challenging task. I selected the relevant objective function as *Maximization of a Contribution Margin.* A contribution margin is the result of *operational sales minus all variable production costs*. Fixed production costs are excluded because they do not vary with the number of units produced. Contribution margin is affected by both sales price and variable production costs. A higher sales price or a lower production cost maximize contribution margin or vice versa. The computation of a contribution margin is presented below. Mathematically I define our objective function for each unit of j^{th} product as follows: mk_j is the direct material cost per unit of j^{th} product; lk_j is direct labor cost per unit of j^{th} product; fk_j is factory overhead cost per unit of j^{th} product; ak_j is variable selling cost per unit of j^{th} product; bk_j is variable managerial cost per unit of j^{th} product. Thus:

$$k_j = mk_j + lk_j + fk_j + ak_j + bk_j$$

k_j is the total variable cost per unit of j^{th} product; c_j is the contribution margin per unit of j^{th} product; p_j is the sales price per unit of j^{th} product. Therefore:

$$c_j = p_j - k_j$$

Based on the above computation I formulate the desired production plan optimization model as:

$$(1-1) \qquad \max. \quad z = \sum_{j=1}^{n} c_j u_j$$

$$(1-2) \qquad \sum_{j-1}^{n} m_{wj} u_j \leq M_w \qquad w = 1,2,...,z$$

$$(1-3) \qquad \sum_{j=1}^{n} f_{ij} u_j \leq F_i \qquad i = 1,2,...,r$$

Subject to:

The above formulated model contains only the three main direct inputs in a production process.

$$(1-4) \qquad e_j \leq u_j \leq d_j \qquad j = 1,2,...,n$$

$$(1-5) \qquad \sum_{j=1}^{n} x_{sj} u_j \leq X_s \qquad s = 1,2,...,t$$

THE NECESSITY OF A POST OPTIMALITY ANALYSIS

There are many factors that cause changes in coefficients of objective function and constraints. These parametric changes are usually interrelated. For example, some major parametric changes are: changes in the contribution margin per unit of j^{th} product (the coefficient of the objective function i.e., c_j); changes in the amount of operational machine hours of w machine types (groups) necessary to process a unit of product j (m_{wj}); changes in the quantity of i^{th} material type necessary to process a unit of product j (f_{ij}); changes in the amount of direct labour hours of s occupational group (or occupational qualifications) necessary to process a unit of product j (x_{sj}); changes in the total available operational machine time of w machine groups for a planned year (M_w); changes in the total available quantity of i^{th} material art for a planned year (F_i); changes in the total available direct labor hour of s^{th} occupational group (X_s); *and* changes in the projected level of demand for a given planned year (d_j).

There are many other possible causes for change in the contribution margin. For example, increase or decrease of sales prices or increase or decrease of the elements of variable production costs affects the contribution margin. Sales prices are affected by many factors such as: competitiveness in market price, demand and supply condition, quality of finished goods and many others. In the same manner, if variable production costs decrease, it may be because of improvements in a production process, increased labor productivity, greater efficiency in material's utilization, and efficiency in machine usage or managerial effectiveness. For example, if the productivity of a machine operator improves the amount of direct labor necessary to process a unit of a product decreases, the same logic applies to direct material and machine hour usage rates. These changes directly affect the contribution margin (the objective function in our case). Based on the above analysis we conclude that the changes equally affect both coefficient of the objective function c_j and the coefficients of resources functions Σa_{ij}. That is: $c_j = \Sigma a_{ij.}$

Changes in the sum of available materials, operational machine and labor hours that are generally defined as b_i. The right-handed side constraints affect the once formulated production plan optimization model significantly. There could be many possible reasons for periodical changes in b_i. For instance, changes in the production volume, changes in the kind of material utilization, etc. All factors that affect the production plan directly should be seriously monitored.

APPLICATION'S CASE- ASMARA SWEATER FACTORY

I tested the above formulated optimization model in a small factory in Eritrea (Africa): Asmara Sweater Factory. The factory produces two types of sweaters: heavy and light sweaters for cold and hot seasons respectively. These two types of sweaters are made up of three types of materials: Wool, Acrylic and Lana. The factory is a good example of the type of small industries existing in the SSA nations. Necessary data for the application of optimization model were obtained from factory documents in 2003. The factory has three processing centers: Spinning, Weaving, and Finishing and Packing operating in a three shift system. Heavy sweater and light sweater are identified as u_1 and u_2 respectively. One unit of both products is a dozen sweaters of different sizes packed together. The basic resources used in production process are operational machine hours, operational direct labor hours and direct material (Wool, Acrylic and Lana). The factory applied an intermittent production system. Therefore, operational machines which perform similar processes are grouped together and located in different process centers. Operational workers are also aggregately grouped and assigned into the three processing centers in order to operate the machines available in each processing centre. The factory operated in three shifts per day except in processing center three (Finishing and Packaging) which is two and half shifts as the condition of work allows saving half shift in labor costs. This means machines in processing center three will be idle for one half shift time.

I averaged 1500 available machine hours per machine for each shift during a planned operational year. I assumed that more than one operator can be assigned to a single machine and operators are trained to be multi-skilled and they can be assigned to any machine in the three processing centers. The nature of the production process is also convenient for job rotation. The derived optimal solution is: 7500 units of product 1; 0 units for product 2; total contribution margin is $450,000. According to the above analysis, the bottleneck is the available operational labor hours in machine group three. Its capacity is completely utilized. However, the others have still unused (idle) resources. To improve the optimal solution and to utilize idle resources, the company should hire additional operators. The maximum operational labor hours we can add is 18,000. Therefore, we have to hire 12 new operators with a capacity of 1500 hours each per year. But as noted earlier, the total cost of hiring additional labor force should be compared with the incremental value of our contribution margin.

WHAT SHOULD BE DONE TO ENHANCE THE IMPLEMENTATION

First, we need to identify problems hindering SMEs in SSA nations from applying helpful optimization models in general. This means we need to evaluate internal capacity of SMEs and their environment. It is not easy in many SSA nations to complement practical application. There are many social, economic, cultural, organizational and other problems encountered by SMEs in the SSA nations. To improve the situation and foster the ability of SMEs to use optimization models successfully, all stakeholders need to take a series of actions. In line with these efforts, I presented the following general recommendations: 1) Each firm must improve its organizational structures and managerial capability in order to create a favorable climate for the application of optimization models. 2) Firms should establish a system of keeping adequate and accurate data that are necessary for the application of relevant optimization models 3) Decision problems should be thoroughly analyzed and formulated. The determination and selection process of a suitable objective function should reflect the peculiar company conditions and characteristics. 4) The application of optimization models is unthinkable without using computers. Therefore, SMEs should acquire and use suitable computers and relevant software programs. 5) Firms need to update those applied models frequently, as they are living in a very dynamic and competitive world. 6) SSA nations need to give emphasis to training and upgrading of the skills of local qualified professionals in decision sciences. This is a good contribution to firms in their endeavors of applying optimization models. 7) Firms should perform the necessary cooperation, experience exchange and joint research with different local and foreign firms and academic institutions. 8) Applications of optimization models should be gradually popularized among the SMEs manager/owners and other senior management personnel via seminars, lectures, short-term courses and by other means of dissemination 9) Colleges and universities in SSA nations should design and offer quantitative oriented courses to their students majoring in business and economics. 10) Governments should help SMEs to import tax-free computers and software packages that are desired for their optimization models application

CONCLUSION

Optimization models have demonstrated their invaluable contribution towards economic efficiency, effectiveness and sustainable industrial development in many countries. Scarce resources need to be optimally utilized. This is a means of survival and prosperity for SSA nations. SMEs are the foundations of industrialization and their further development depends on proper management. The optimization model formulated in this paper is basic in its mathematical background and simple in application approaches. Of course, there will be many unanswered “IFs”, “THENs”, and “HOWs” and “WHYs” situational scenarios. This paper provides a springboard for further research in practical application of optimization models to industrial SSA nation management decisions. The paper contains a foundational framework that is open for further improvement on how SMEs managers can appropriately apply optimization models to enhance efficiency and effectiveness in operational activities of their firms.

The challenge ahead is to integrate the theoretical knowledge with practice. Failure to adapt optimization models to a particular situation and using inaccurate operational data can have detrimental impacts on applications of optimization models (Ashayeri and Selen, 2003). This paper has a limited scope and many questions need to be addressed. They are subject to further research and investigation. Firstly, other, note easily traceable resource constraints are not considered to reduce the model complexity. Secondly, future events are always uncertain and can trigger the unreliability of forecasted demands for a specific period. Firms should take care to ensure that their forecasted demands are reasonable, realistic and with less forecasting errors. Thirdly, the complexity of estimating labor hours, machine hours and other resources as aggregated constraints is an intricate task. It demands that firms should maintain a prudent and efficient operational activities record keeping and cost accounting systems. It was not easy to obtain the desired operational data from the Asmara Sweater Factory. I am aware that the application of optimization models is subject to trial and error. But, even the simplest model is helpful, and serves to disprove the unwarranted perception of non-applicability of mathematical models in developing economies.

There is a wide spread phobia among SMEs' owners/managers for applying mathematical models. Most believe that applying mathematical models is like spending time and resources on abstract theories (Gilbert, 2003, Ashayeri and Selen, 2003). To avoid this misperception, models should be presented in the way SMEs' owner/managers can understand and appreciate their use.

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