

FEASIBILITY OF COSTING MODEL VARIANTS: AN INVESTIGATION OF SMALL SCALE INDUSTRY

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ABSTRACT

Activity-based costing as a technique has proved an innovative practice in the area of management accounting. ABC has facilitated companies to classify the true costs of not only product and services but also processes. This empowered management to make sound decisions related to profitability and the effectiveness of their production process. Many scholars have proved the advantage of activity-based costing over traditional costing system; this paper explores the benefits of ABC to the Small & Medium Enterprises (SMEs) population. Also, the challenges faced by SMEs. The paper demonstrates the framework for ABC implementation with the support of real-time case of an Indian SME.

Key word: Costing model, SSI, Strategy

INTRODUCTION

The development that was orchestrated with technological advancement, witnessed experimentation and innovation galore in the mid-1980s which further lead to the development of innovative practices in the management world. These practices embrace innovative costing techniques initiated through Activity Based Costing. Literary evidences related with innovation in accounting practices, highlights, technological advancement in manufacturing practices have been around those primary persuasive elements answerable for criticizing the performance of traditional management accounting

techniques (Askaramy & Smith 2004, 2003; Benet et al 1994, Bork & Morgan 1993, Chenhall 2003, Gosselin 1997, Hartnett & Lowry 1994, Lefebvre & Lefebvre 1993, Spicer 1992).

Amid most recent two decades, traditional cost and management accounting techniques have been under academic radar for its alleged inability to give itemized and convenient data and to content the users of such data (Askaramy 2005 & 2003, Baines & Langfield Smith 2003). This paper demonstrates the benefits bestowed to an Indian SME and its impact on the profitability of the company.

LITERATURE REVIEW

Harvard Business Review and numerous different literature and journals have published about ABC, execution of ABC and its effect on manufacturing process vis a vis organization performance. literature dating around the 1980s, impulses ABC as a device for exactness of product cost utilizing cost pools and cost drivers. This helped management to recognize gainfulness of products. They watched the many-sided quality off executing the ABC framework. Mid 1990s forms exhibit basic viewpoint of ABC, where on one hand; practitioners saw with the execution of ABC management could oversee cost and exercises prompting the development of Activity-Based Management. Then again, commentators were contending the irregularity of ABC with the standards of nonstop change, add up to quality management, the absence of customer center, conflicting with the theory of constraints. In the nutshell, ABC was confronting the moving impacts.

In justification of the proclamations made against ABC, Kaplan averred that ABC

framework gave profitable monetary data in regards to process change and consumer loyalty. It was too soon to assess the execution. Or maybe ABC framework produces data to be incorporated with other data, for example, customer profitability, process quality, and revenue and process duration.

Notwithstanding the basic editorial, low attention, and disappointment in ABC framework usage, ABC proceeded on its expectation to absorb information. With its persistent advancement, ABC materialness expanded to zones outside the extent of cost accounting. Academicians and practitioners were applying ABC framework in the regions of marketing, logistics, and supply chain. It likewise began to apply in spaces like banking, healthcare, energy and different enterprises. ABC points of interest prompt the rise of ABM yet, in addition, led scholastics and managers to look at how ABC could communicate with other management advancements and change initiatives, for example, TQM, EVA or TOC.

Industry	Title	Authors	Years
Manufacturing	A generalised cost-estimation model for job shop	Aderoba, A.	<u>1997</u>
Logistics	Application of activity-based costing to a land transportation company: a case study	Baykaso □ Lu, A.; Kaplano □ lu, V.	<u>2008</u>
Postal service	Applying activity-based costing model on cost accounting of provider of universal postal services in developing countries	Blagojević, M.; Marković, D.; Kujačić, M.; Dobrodolac, M.	<u>2010</u>
Healthcare	Improving hospital cost accounting with activity-based costing	Chan, Y. C.	<u>1993</u>
Police	Costing police services: the politicization of accounting	Collier, P. M.	<u>2006</u>

Hotel	Customer profitability analysis with time-driven activity-based costing: a case study in a hotel	Dalci, I.; Tanis, V.; Kosan, L.	<u>2010</u>
Health care	Health-care financial management in a changing environment	Devine, K.; O'clock, P.; Lyons, D.	<u>2000</u>
Health care: Physician	Development of an activity-based costing model to evaluate physician office practice profitability	Dugel, P. U.; Tong, K. B.	<u>2011</u>
Health care: Intensive care	A new method of accurately identifying costs of individual patients in intensive care: the initial results	Edbrooke, D. L. Stevens, V. G.; Hibbert, C. L.;	<u>1997</u>
Library	Activity-based costing in user services of an academic library	Ellis-Newman, J.	<u>2003</u>
Library	The cost of library services: Activity-based costing in an Australian academic library	Ellis-Newman, J.; Robinson, P.	<u>1998</u>
Healthcare: Mammography	Providing professional mammography services: financial analysis	Enzmann, D. R.; Anglada, P. M.; Haviley, C.; Venta, L. A.	<u>2001</u>
Health care	Building an activity-based costing hospital model using quality function deployment and benchmarking	González, M. E.; Quesada, G.; Mack, R.; Urritia, I.	<u>2005</u>
Service	Management accounting systems in Finnish service firms	Hussain, M. M.; Gunasekaran, A.; Laitinen, E. K.	<u>1998</u>
Financial institution	The application of activity-based costing in the United Kingdom's largest financial institutions	Innes, J.; Mitchell, F.	<u>1997</u>
Library	Time-driven activity-based costing for inter-library services: a case study in a university	Pernot, E.; Roodhooft, F.; Van den Abbeele, A.	<u>2007</u>
Health care	Activity-based costs of blood transfusions in surgical patients at four hospitals	Shander, A.; Hofmann, A.; Ozawa, S.; Theusinger, O. M.; Gombotz, H; Spahn, D R	<u>2010</u>
Health care	Costs and effects in lumbar spinal fusion: a follow-up study in 136 consecutive patients with chronic low back pain	Soegaard, R.; Christensen, F. B.; Christiansen, T.; Bünger, C.	<u>2007</u>
Logistic	Logistic costs case study: an ABC approach	Themido, I.; Arantes, A.; Fernandes C.; Guedes A P.	<u>2000</u>
Tourism	Activity-based management and traditional costing in tourist enterprises (a hotel implementation model)	Vazakidis, A.; Karagiannis, I.	<u>2011</u>
Health care	Application of activity-based costing (ABC) for a Peruvian NGO healthcare provider	Waters, H.; Abdallah, H.; Santillán, D.	<u>2001</u>
Education	Adoption of Activity-based costing: A survey of the education sector of Greece	John Sorros; Alkiviadis Karagiorgos; Nikos Mpelesis	2017

Source: Stefano and Filho (2013)

BENEFITS		
Accurate cost information for product costing	Qian & Bin-Arich	2008
	Charles & Hansa	2008
	Ozbayrak et al	2004
	Tayles & Drury	2001
	Clarke et al	1999
	Hussain et al	1998
	Kingsman & De Souza	1997
	Pirttila & Sandstrom	1996
	Friedman & Lynne	1995; 1999
Improve performance measurement system	Gunasekaran & Sarhadi	1998
	Kim et al	1997
Facilitating optimal joint product mix decisions	Tsai et al	2008
	Kee	2008
Improved cost control	Clarke et al	1999
	Hussain et al	1998
	Friedman & Lynne	1995; 1999
Cost reduction	Bescos et al	2001
	Andrade et al	1999
	Gunasekaran & Sarhadi	1998
	Hussain et al	1998
	Innes & Mitchell	1995
Accurate allocation of indirect costs	Hussain et al	1998
Improved insight into cost causation	Clarke et al	1999
	Hussain et al	1998
	Friedman & Lynne	1995; 1999
Identification of activity costs	Hussain et al	1998
Improvement of operational efficiency	Kee	2008
	Tayles & Drury	2001
Improve customer profitability analysis	Bescos et al	2001
	Tayles & Drury	2001
	Clarke et al	1999
	Innes & Mitchell	1995
Accurate cost information for pricing	Kee	2008
	Bescos et al	2001
	Tayles & Drury	2001
	Kocakulah et al	2000
	Clarke et al	1999
	Innes & Mitchell	1995
Prepare relevant budgets	Bescos et al	2001
	Tayles & Drury	2001
	Innes & Mitchell	1995

Modernize cost accounting system for better depicts costs or to improve their business processes	Satoghi et al Tatsiopoulos & Panayiotou Hussain et al Malmi Spedding & Sun Salafatinos	2006 2000 1998 1999 1999 1996
Supply chain tactical production planning	Comelli et al Whicker et al	2008 2006
Supporting decision making	Thyssen et al Seneschal & Tahon	2006 1998
Designing & development of activities	Ben-Arieh & Qiar Tornberg et al Gunasekaran & Sarhadi	2003 2002 1998

Source: Authors' compilation

DIFFICULTIES		
Reservations from employees or managers regarding the usefulness of the new system	Tayles & Drury Clarke et al Gunasekaran et al Hussain et al Innes & Mitchell	2001 1999 1999 1998 1995
Difficulties in identifying & selecting activities or cost drivers	Clarke et al Hussain et al	1999 1998
Problems in accumulating cost data for new system or lack of resources	Tayles & Drury Clarke et al Hussain et al	2001 1999 1998
Time-consuming	Gunasekaran et al	1999
Excessive cost budget	Tayles & Drury Hussain et al	2001 1998
Inadequate computer software	Clarke et al	1999

Source: Authors' compilation

REJECTION		
Satisfaction with the existing costing system	Bescos et al Innes et al Innes & Mitchell	2001 2000 1995
Implementation associate high cost	Bescos et al	2001
Lack of assessment time	Innes & Mitchell	1995
Perceive inadequate accurate cost information	Bescos et al	2001
Lack of management support	Innes et al Innes & Mitchell Friedman & Lynne	2000 1995 1995; 1999

Source: Authors' compilation

SMEs which aspires to be a business visionary and ready for imaginative flight, accept fortitudes of these factors and further more have a penchant as the main adopters the of new systems in the market. Likewise Shieldsa and Young (1994) contended that firms-which are small-sized in operations- progressively achieve aggressive edge through creative action by adopting an innovation.

In an exhaustive survey of 60 large and medium-sized manufacturing companies in India, Joshi (2001) thesis that adoption rate of 20% for ABC, 13% for ABM and 7% for activity-based budgeting. Adoption of these contemporary management accounting techniques has been highly contributed by factors like the magnitude of total assets. Owing to higher perceived benefits, practitioners put much weight on the traditional management accounting techniques against contemporary techniques.

Through a case study of two branches of a large Indian private sector bank, Narasimhan & Thampy (2002) promulgated ABC system for establishing service cost for customers with multifaceted operations. Scholars have profusely talked about the utility of ABC information in business process outsourcing and identification of value added and non-value added activities and benchmarking branch network restructuring. Ahmad et al (2017) investigated the implementation of ABC in SMEs in Malaysia with a response rate of 108, 17% of respondents have adopted ABC. The indicators like

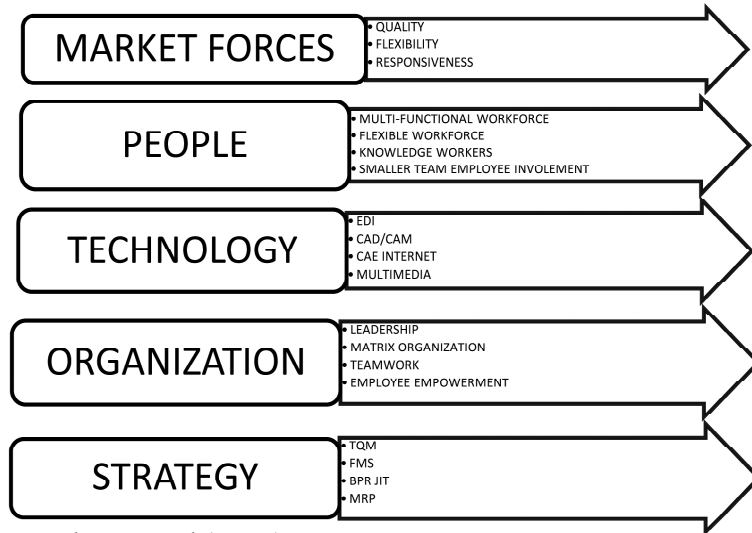
the degree of intricacies in a manufacturing environment and top management unflinching support stand as testimony to successful implementation. Reasons for rejection include lack of resources, expertise and cost factor.

Bromwich and Bhimani (1989) concurred that the product cost distortions could be easily rectified though ABC while. Hubbell (1996) laid stress on forging ABC management systems vis a vis shareholder value such as EVA. Advocating a comprehensive relation between ABC implementation and shareholder value, Kennedy & Affleck Graves (2001) strongly voted for ABC analysis.

Dini and Guerginal (1994) have distinguished some imperative elements impacting the success of small and medium-sized firm's (SME's) system. The essential achievement factors for the usage of activity-based costing (ABC) in SMEs are deciphered with mettle in making quality products and services and effective vigil on the capital intensity and debt levels. Another vital potential lies in owning and translating the capacity to actualize a successful approach. Accordingly, any authoritative process that decreases the cash surges for an SME undertaking is prone to have a positive effect as far as a lessening of obligation, and the significant investment funds transformed into benefits. Besides, the viable control of income may decrease long-term capital prerequisites and lighten the normal SMEs issue of under-capitalization.

As identified by Gunasekaran et al (1999), following criteria to justify the application

of ABC in SMEs undertaking as per their characteristics:



Source: Gunasekaran et al (1999)

The present period of worldwide competition is driving all SMEs towards a reestablished sense of duty regarding magnificence in manufacturing. The conventional costing frameworks do not give sufficient non-financial data about SMEs. The customary cost frameworks give little data about what makes a difference to the customers (which is the primary prerequisite of any world-class organization). Factors, for example, quality and administration are out of their domain. They report just financial related data. Non-financial related data, for example, defect rates and throughput rates in every movement are past the extent of the conventional costing framework. As of late, SMEs have decreased their reliance on customary costing frameworks by creating ABC frameworks. At first,

managers observed the ABC approach as a more exact method for computing product costs. In any case, ABC has developed as a hugely helpful manual for managerial actions that can make an interpretation of higher benefits (Cooper and Kaplan, 1991). Understanding the significance of ABC in SMEs to remain aggressive, an endeavour has been made in this paper to build up a structure for the usage of ABC in SMEs which is demonstrated with the help of a real-time case in the following section.

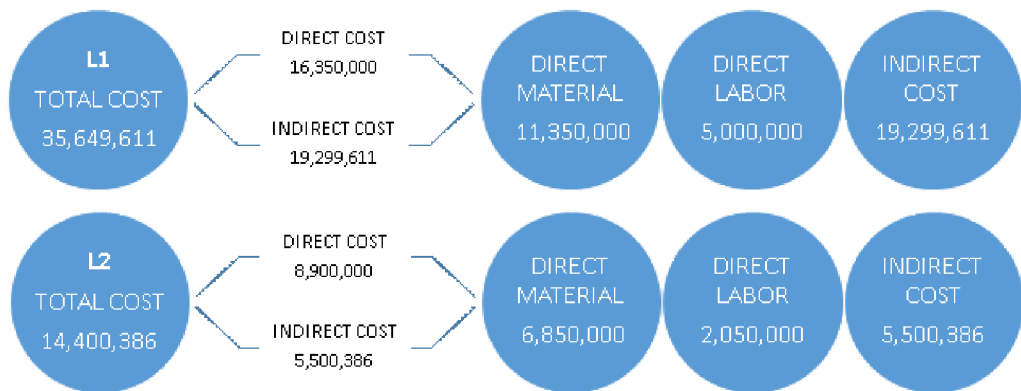
CASE STUDY

The researcher was approached by an Indian SME located in the outskirts of Delhi. The firm was engaged in the production of lenses for the taillights of automobiles. They got a contract of

manufacturing lenses, L1 and L2, from an automobile company. The production process of L1 was more complex as compared to L2 because of its special features including multicolour moulding. The firm was running at capacity and had good competition for L1 lenses. With the competition faced by the firm, the customer informs them competitive price by another competitor for L1 lenses at Rs 450 as compared to their price of Rs 650. Such competition was not faced by L2 lenses which were priced at Rs 1200 each.

For such competition, the management had two options in front of them, first, to forgo

the order of L1 lenses to their competitor. Thus, not supplying L1 lenses to the customer. Second, reduce the price of lenses by either lowering the margin or by reducing cost. To study such situation, the researcher tried to understand their costing system particularly manufacturing overhead. They found the company used to allocate indirect costs using a single indirect cost rate based on labour hours, 38,550 hours. The company managers budgeted 30,000 hours to manufacture 60,000 L1 lenses and 8,550 hours for 15,000 L2 lenses. Thus, bringing the cost of L1 at Rs 594.16 and L2 at Rs 960; this made the firm to earn a profit margin of 8.6% for L1 and 20% for L2.



It made management to take a tough call on L1 lenses as their design team has already evaluated and analyzed L1 operations comparing to their competitor, is a competitive product in the market.

The researcher observed, after reviewing firm's costing system, the complexity of firm's costing environment in term of

allocation of overhead towards both the product, L1, and L2. They identified miscasting of product costs as management was confident about the direct material and labour as it was easily traceable but were concerned about the accuracy of the system to measure overhead used by each product. To resolve

the challenge faced by the firm, researcher introduced an Activity-based system to the management and convinced them to implement ABC system for cost allocation.

The researcher along with the management made a team for identifying the activities to break down its current single indirect pool to improved pools of cost related to various activities.

Indirect cost pool	Design products and processes	4,000,000	100 parts square feet
	Setting up machine	3,500,000	2,000 set up hours
	Operate machine	6,580,000	12,750 machine hours
	Administration of processes	800,000	39,550 admin hours
	Batches of finished lenses for shipment	3,500,000	200 shipments
	Distribution	2,500,000	67,500 cubic feet delivered
Direct cost pool	Clean and maintenance of machines	3,920,000	

It was observed that maintenance activity was easily traceable to a particular product, thus, considered as direct cost pool and included in the direct cost. This made the direct cost

as Rs 29,170,000. After computing rate per unit of each cost allocation base, total indirect cost based on activities defined was calculated for each product.

	Single Cost Pool system	Activity Cost Pool system (ABC)	Difference
Direct cost items	Direct Material + Direct labor	Direct Material + Direct labor + Maintenance	
Direct cost	25,250,000	29,170,000	3,920,000
Indirect cost items	Single indirect cost pool	Design + Setting up + Operation + Administration + Shipment + Distribution	
Indirect cost pool	24,800,000	20,880,000	(3,920,000)
Total cost: L1	35,649,611	24,465,920	
L2	14,400,386	25,584,080	
Cost per unit L1	594.16	407.76	(186.4)
L2	960	1705.6	745.6

With the help of ABC system, management was able to trace more cost as a direct cost, created uniform cost pools related to different activities and for each cost pool, ABC system identified appropriate cost allocation base that has a cause-effect relationship with costs in the cost pool. Uniformity in cost pool and allocation base, linked to the cost hierarchy, gave management a confidence in the cost numbers for the products and identified L1 was overcost by Rs 186.40. Thus, management can match its competitor's price and make a profit by considering the order below competitor's price.

Also, management was able to identify how and where to reduce costs. The target of cost reduction was foreseen as per the cost per unit of the cost allocation base in distribution activity by decreasing distribution cost per cubic foot of product delivered from Rs 60 to Rs 58 by reducing the rental costs. The motive was to reduce the cost by improving the process without comprising customer service. Thus, management attempted to take out only those costs that are non-value added. It was also observed when single cost pool allocation based on direct labour hours was used, gave a wrong signal that the firm was choosing those designs that most reduce direct labour hours, in fact, there was a weak cause-effect relationship between direct labour hours and indirect costs. They also used the system in their budgeting process to compare their actuals with a budgeted number for adjusting under-allocated or overallocated indirect costs for each activity.

CHALLENGES

While implementing the ABC system, researcher faced few challenges including implementation of ABC which brings a significant change in the system. It requires management to decide on activities and its level copiously. It is not only the support of top management to implement the system but also managers' cooperation is required as they have the knowledge about activities and cost drivers. It was essential to bring them into the system for their expertise, proper credibility, coordination and the required leadership.

CONCLUSION

The case findings suggest that single cost pool system is unable to mirror the activities and assets expired at some stage in the production process with the intention to distort cost numbers. The ABC system gives correct cost data with a couple of activity cost drivers and casual relationships among resource consumption and costs all through manufacturing. The cost records are the crucial references that help SME firms set approach to price properly. The studies framework, implementation procedure of ABC system and research findings of this paper can provide beneficial reference and contribution to the SME firms which are going through the competitive global environment.

REFERENCES

Andrade, M. C., Pessanha Filho, R. C., Espozel, A. M., Maia, L. O. A., & Qassim,

- R. Y. (1999). Activity-based costing for production learning. *International journal of production economics*, 62(3), 175-180.
- Ben-Arieh, D., & Qian, L. (2003). Activity-based cost management for design and development stage. *International Journal of Production Economics*, 83(2), 169-183.
- Boukherroub, T., Ruiz, A., Guinet, A., & Fondrevelle, J. (2015). An integrated approach to sustainable supply chain planning. *Computers & Operations Research*, 54, 180-194.
- Charles, S. L., & Hansen, D. R. (2008). An evaluation of activity-based costing and functional-based costing: A game-theoretic approach. *International Journal of Production Economics*, 113(1), 282-296.
- Clark, B. H. (1999). Marketing performance measures: History and interrelationships. *Journal of marketing management*, 15(8), 711-732.
- Clarke, A. (1999). A practical use of key success factors to improve the effectiveness of project management. *International journal of project management*, 17(3), 139-145.
- Clarke, P. J., Hill, N. T., & Stevens, K. (1999). Activity-based costing in Ireland: Barriers to, and opportunities for, change. *Critical Perspectives on Accounting*, 10(4), 443-468.
- Cohen, S., Venieris, G., & Kaimenaki, E. (2005). ABC: adopters, supporters, deniers and unawares. *Managerial auditing journal*, 20(9), 981-1000.
- Comelli, M., Fenies, P., & Tchernev, N. (2008). A combined financial and physical flows evaluation for logistic process and tactical production planning: Application in a company supply chain. *International journal of production economics*, 112(1), 77-95.
- Dugel, P. U., & Tong, K. B. (2011). Development of an activity-based costing model to evaluate physician office practice profitability. *Ophthalmology*, 118(1), 203-208.
- Edbrooke, D. L., Stevens, V. G., Hibbert, C. L., Mann, A. J., & Wilson, A. J. (1997). A new method of accurately identifying costs of individual patients in intensive care: the initial results. *Intensive Care Medicine*, 23(6), 645-650.
- Ellis-Newman, J. (2003). Activity-based costing in user services of an academic library.
- Ellis-Newman, J., & Robinson, P. (1998). The cost of library services: Activity-based costing in an Australian academic library. *The Journal of Academic Librarianship*, 24(5), 373-379.
- Enzmann, D. R., Anglada, P. M., Haviley, C., & Venta, L. A. (2001). Providing professional mammography services: financial analysis. *Radiology*, 219(2), 467-473.
- Fenlon, H. M., Nunes, D. P., Schroy, P. C., Barish, M. A., Clarke, P. D., & Ferrucci, J. T. (1999). A comparison of virtual and conventional colonoscopy for the detection of colorectal polyps. *New England Journal of Medicine*, 341(20), 1496-1503.

- Friedman, A & Lyne, S, 1997, 'Activity-based techniques and the death of the bean counter'. *European Accounting Review*, vol 6/1., pp. 19 - 44
- González, M. E., Quesada, G, Mack, R., & Urrutia, I. (2005). Building an activity-based costing hospital model using quality function deployment and benchmarking. *Benchmarking: An International Journal*, 12(4), 310-329.
- Gunasekaran, A. (1999). Agile manufacturing: a framework for research and development. *International journal of production economics*, 62(1-2), 87-105.
- Gunasekaran, A., & Sarhadi, M. (1998). Implementation of activity-based costing in manufacturing. *International journal of production economics*, 56, 231-242.
- Gunasekaran, A., Marri, H. B., & Grieve, R. J. (1999). Activity-based costing in small and medium enterprises. *Computers & Industrial Engineering*, 37(1-2), 407-411.
- Hussain, A., & Zhuang, J. (1998). Enterprise Taxation and Transition to Market Economy'. *Taxation in Modern China*, London: Routledge, 43-68.
- Hussain, M. M., Gunasekaran, A., & Laitinen, E. K. (1998). Management accounting systems in Finnish service firms. *Technovation*, 18(1), 57-67.
- Hussain, M. M., Gunasekaran, A., & Laitinen, E. K. (1998). Management accounting systems in Finnish service firms. *Technovation*, 18(1), 57-67.
- Hussain, M. M., Gunasekaran, A., & Laitinen, E. K. (1998). Management accounting systems in Finnish service firms. *Technovation*, 18(1), 57-67.
- Innes, J., & Mitchell, F. (1995). A survey of activity-based costing in the UK's largest companies. *Management accounting research*, 6(2), 137-153.
- Innes, J., Mitchell, F., & Sinclair, D. (2000). Activity-based costing in the UK's largest companies: a comparison of 1994 and 1999 survey results. *Management accounting research*, 11(3), 349-362.
- John, I., & Falconer, M. (1997). The application of activity-based costing in the United Kingdom's largest financial institutions. *Service Industries Journal*, 17(1), 190-203.
- Kee, R. (2008). The sufficiency of product and variable costs for production-related decisions when economies of scope are present. *International Journal of Production Economics*, 114(2), 682-696.
- Kingsman, B. G., & de Souza, A. A. (1997). A knowledge-based decision support system for cost estimation and pricing decisions in versatile manufacturing companies. *International Journal of Production Economics*, 53(2), 119-139.
- Kocakulah, M. C., Bartlett, J., & Albin, M. (2009). ABC for calculating mortgage loan servicing expenses. *Cost Management*, 23, 3644.
- Lamminmaki, D., & Drury, C. (2001). A comparison of New Zealand and British product-costing practices. *The International Journal of Accounting*, 36(3), 329-347.

- Langfield-Smith, K. (1997). Management control systems and strategy: a critical review. *Accounting, organizations and society*, 22(2), 207-232.
- Lin, B., Collins, J., & Su, R. K. (2001). Supply chain costing: an activity-based perspective. *International Journal of Physical Distribution & Logistics Management*, 31(10), 702-713.
- Lyne, S & Friedman, A, 1995, 'Activity Based Techniques: The real life Consequences'. CIMA Publishing
- Malmi, T. (1999). Activity-based costing diffusion across organizations: an exploratory empirical analysis of Finnish firms. *Accounting, organizations and society*, 24(8), 649-672.
- Mendoza, C., & Bescos, P. L. (2001). An explanatory model of managers' information needs: implications for management accounting. *European Accounting Review*, 10(2), 257-289.
- Mia, L., & Clarke, B. (1999). Market competition, management accounting systems and business unit performance. *Management Accounting Research*, 10(2), 137-158.
- Oshikoya, T. W., & Hussain, M. N. (1998). Information technology and the challenge of economic development in Africa. *African Development Review*, 10(1), 100-133.
- Özbayrak, M., Akgün, M., & Türker, A. K. (2004). Activity-based cost estimation in a push/pull advanced manufacturing system. *International journal of production economics*, 87(1), 49-65.
- Pernot, E., Roodhooft, F., & Van den Abbeele, A. (2007). Time-driven activity-based costing for inter-library services: a case study in a university. *The Journal of Academic Librarianship*, 33(5), 551-560.
- Pirttilä, T., & Sandström, R. (1996). A step-wise method for product range management and production control decisions: A case study at a board industry company. *International journal of production economics*, 45(1-3), 223-230.
- Qian, L., & Ben-Arieh, D. (2008). Parametric cost estimation based on activity-based costing: A case study for design and development of rotational parts. *International Journal of Production Economics*, 113(2), 805-818.
- Raviart, D., Sénéchal, O., & Tahon, C. (1998). Methodology for a physico-economic product evaluation, starting in the design phase. *Control Engineering Practice*, 6(4), 489-498.
- Shander, A., Hofmann, A., Ozawa, S., Theusinger, O. M., Gombotz, H., & Spahn, D. R. (2010). Activity based costs of blood transfusions in surgical patients at four hospitals. *Transfusion*, 50(4), 753-765.
- Soegaard, R., Christensen, F. B., Christiansen, T., & Bünger, C. (2007). Costs and effects in lumbar spinal fusion. A follow-up study in 136 consecutive patients with chronic low back pain. *European Spine Journal*, 16(5), 657-668.
- Sorros, J., Karagiorgos, A., & Mpelesis, N. (2017). Adoption of Activity-Based Costing: A Survey of the Education Sector

- of Greece. *International Advances in Economic Research*, 23(3), 309-320.
- Spedding, T. A., & Sun, G. Q. (1999). Application of discrete event simulation to the activity based costing of manufacturing systems. *International journal of production economics*, 58(3), 289-301.
- Ståhl, J. E. (2017). An integrated cost model for metal cutting operations based on engagement time and a cost breakdown approach. *International Journal of Manufacturing Research*, 12(4), 379-404.
- Taba, L. M. (2009). Measuring the successful implementation of Activity Based Costing (ABC) in the South African post office (Doctoral dissertation).
- Tatsiopoulos, I. P., & Panayiotou, N. (2000). The integration of activity based costing and enterprise modeling for reengineering purposes. *International Journal of Production Economics*, 66(1), 33-44.
- Tayles, M., & Drury, C. (2001). Moving from make/buy to strategic sourcing: the outsource decision process. *Long Range Planning*, 34(5), 605-622.
- Themido, I., Arantes, A., Fernandes, C., & Guedes, A. P. (2000). Logistic costs case study—an ABC approach. *Journal of the Operational Research Society*, 51(10), 1148-1157.
- Thyssen, J., Israelsen, P., & Jørgensen, B. (2006). Activity-based costing as a method for assessing the economics of modularization—A case study and beyond. *International journal of production economics*, 103(1), 252-270.
- Tornberg, K., Jämsen, M., & Paranko, J. (2002). Activity-based costing and process modeling for cost-conscious product design: A case study in a manufacturing company. *International Journal of Production Economics*, 79(1), 75-82.
- Tsai, W. H., Chen, H. C., Leu, J. D., Chang, Y. C., & Lin, T. W. (2013). A product-mix decision model using green manufacturing technologies under activity-based costing. *Journal of cleaner production*, 57, 178-187.
- Vazakidis, A., & Karagiannis, I. (2011). Activity-based management and traditional costing in tourist enterprises (a hotel implementation model). *Operational Research*, 11(2), 123-147.
- Waters, H., Abdallah, H., & Santillán, D. (2001). Application of activity based costing (ABC) for a Peruvian NGO healthcare provider. *The International Journal of Health Planning and Management*, 16(1), 3-18.