Accounting and Management Information Systems
Vol. 20, No. 1, pp. 28-55, 2021
DOI: http://dx.doi.org/10.24818/jamis.2021.01002

Contextualizing cost system design: A literature review

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Abstract

Research Question: What are the measures or proxies used to evaluate Cost System Design (CSD) performance in the literature? What are the contextual factors studied in relation to CSD in the literature?

Motivation: Evaluating the effectiveness of a cost system design should be linked to how the cost information produced would impact managerial decision making in an organization. Unfortunately there are no common measures or proxies for evaluating CSD functionality across different studies and contexts. This calls for further research for defining evaluative criteria suitable for various cost systems in addition to exploring the varying impact of different contextual factors on CSD.

Idea: This paper reviews how CSD functionality measurement have changed over time reflecting different relationships with various contextual factors through analysing and synthesising extant cost accounting literature

Data: Review of relevant papers reporting empirical results (quantitative and qualitative) published in various accounting journals during the periods of 1987 to 2020.

Tools: Qualitative review of relevant papers

Findings: The review revealed that majority of the studies are contingency based, CSD sophistication measurement evolved from distinct choices of cost systems to more structural characteristics and critical attributes of system characteristics. The paper points out to the need for more comprehensive conclusive framework for evaluating CSD performance assessing the impact of different contextual factors on cost system functionality and firm performance.

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Contribution: This review contributes to existing cost accounting literature by reviewing and analysing different measures of CSD functionality in general without stressing a particular cost system.

Keywords: cost system design, cost system sophistication, contextual factors, contingency theory, literature review

JEL codes: M410

1. Introduction

In 1987**,** Johnson and Kaplan first introduced the notion of "*Relevance Lost"* to describe the evolution of Management Accounting Practices (MAPs) through the different development and stagnation phases. They further argued that by 1925 all MAPs that are still prevailing today had been developed. How would such practices, which were developed in a totally different context, be valid until now? In reality they are not valid; they are actually providing organizations with inaccurate and irrelevant information to base their decisions on. More specifically they concluded that existing costing systems failed to cope with the changing business environment including the increased level of competition, advancements in information and manufacturing technology (Nodast *et al.*, 2015). These changes made companies alter their perspective in terms of using cost information for different purposes focusing more on quality, efficiency and customer value rather than the prevailed domination of financial requirements (Abdel-Kader & Luther, 2008; Sharaf-Addin *et al*., 2014).

Since Johnson and Kaplan publication in 1987, a prominent stream of literature was directed to filling the research-practice gap through introducing more improved costing systems to enhance information quality and utilize purpose appropriate cost information in different contexts (Kaplan & Anderson, 2004; Gervais *et al.*, 2010; Perkins & Stovall, 2011; Al-Qady & Jones, 2016; Perčević & Hladika, 2016). Examples of such systems include Activity Based Costing (ABC), Time Driven Activity Based Costing (TDABC) and Resource Consumption Accounting (RCA). The evolution of cost systems stresses the varying impacts of contextual factors on the relevance of cost information. More specifically, cost systems have evolved from providing historical, non-frequent, non-accurate cost information to providing predictive, frequent and more accurate cost information more appropriate for managerial needs. This implies that the design of the cost system should be linked to the different managerial purposes so as to provide value adding information able to enhance organizational performance.

Literature have provided inconclusive findings relating to the evaluation of Cost Systems Design (CSD) to be able to measure it's functionality and ability to meet

managerial needs in different contexts (Al-Omiri & Drury, 2007; Van Triest & El shahat, 2007; Cohen & Kaimenaki, 2011; Pike *et al*., 2011). The problem of not being able to measure CSD functionality makes comparing different systems to be difficult. For this reason, cost accounting literature advocated multiple perspectives for measuring CSD elements or attributes that enable evaluating the performance of such systems. The decision about the suitability of cost system design is crucial; organizations are interested in knowing the return on investing in more sophisticated cost systems. If the design of more extensive cost systems is not justifies by improved performance or more "fit" with surrounding context, it would be considered a waste of resources (Uyar & Kuzey, 2016a).

Unfortunately there are no common measures or proxies for evaluating CSD functionality across different studies and contexts; consequently, the process of building a body of accumulated knowledge is considered to be challenging (Bromwich & Scapens, 2016). This calls for further research for defining evaluative criteria suitable for various cost systems in addition to exploring the varying impact of different contextual factors on CSD. To the researchers' knowledge, the relation between CSD and different contextual factors is still considered a fertile research area considering the ever changing circumstances facing the business environment (Hutchinson, 2010). Moreover, literature on CSD is fragmented and inconclusive due to the existence of a variety of alternative forms and related concepts either theoretically developed or emerged from practice (Wihinen, 2012).

This review is motivated by the various calls of previous studies concerning the need for more extensive research on cost system functionality and exploring the impact of different contextual factors on cost system design choices (Abernethy *et al.*, 2001; Pizzini, 2006; Pavlatos & Paggios, 2009; Schoute, 2009; Bromwich & Scapens, 2016; Messner, 2016; Kuzey *et al*., 2019). More specifically, cost system functionality as a construct have been differently conceptualized and studied from different perspectives and contexts. Consequently, this review is intended to identify, understand and synthesis relevant literature relating to CSD functionality in amore integrative manner within different contextual boundaries. This review is not considered to be a systematic review of all related literature and it won't utilize any statistical methods like meta-analysis to identify patterns, disagreements, or relationships that might exist in the literature selected. Instead, a qualitative review of literature would be undertaken covering relevant papers reporting empirical results (quantitative and qualitative) published in various accounting journals during the periods of 1987 to 2020 with the aim of analysing and evaluating how CSD functionality measurement have changed over time reflecting different relationships with various contextual factors.

Unlike previous research on reviewing cost accounting systems, this review focuses on the different measures of CSD functionality in general without stressing

a particular cost system cost system. Moreover, the reviewed articles will include only relevant articles relating to CSD in different context rather than relying on research evidence from other related fields like Management information systems or management control systems (Al-Omiri & Drury, 2007). Cost accounting systems are viewed as a subset of Management Accounting and Control Systems (MACS) which justifies the mutual use of evidence among different studies in the literature. Evidence from such fields cannot be directly used to explain specific cost system design choices simply because different systems have different purposes and hence, different impact on performance.

The main aim of this paper is to review extant CSD literature with the purposes of analysis and synthesis of available findings relating to CSD functionality in different contexts. Review of the available literature would highlight strength and limitations of existing research identifying possible research gaps and proposing future research directions. Moreover, review of previous research would pinpoint the discrepancies between what was already known about CSD and what is really needed to be known either from an academic or practical dimension.

This review would attempt to answer the following questions:

- What are the measures or proxies used to evaluate CSD performance in the literature?
- What are the contextual factors studied in relation to CSD in the literature?
- How was the contextual factors-CSD relation studied in the literature?
- What are the future research recommendations based on this review?

The paper would be organized as follows: The second section would discuss the methodology and methods adopted by the paper, the third section would review extant CSD literature, followed by results analysis and finally discussion and conclusion.

2. Methodology and methods

The main objective of this research is to critically review relevant CSD functionality literature through exploring the different facets of such concept in relation to various contexts. The scope of the literature review focuses on the evolution CSD performance measurement over time and the nature and impact of different contextual factors on CSD performance. Based on the research objective, scope and questions, a qualitative literature review (narrative) is conducted with the aim of synthesising, analysing and explaining different streams of relevant literature relating to the topic selected. Unlike systematic literature review that usually utilizes statistical techniques to measure the effect size of a certain relationship between two variables, qualitative literature reviews focuses more on clarifying and explaining complex and controversial research areas requiring

further synthesising for better identification of strength and limitations of previous research. To explore relevant literature on CSD functionality it was difficult to specify an exact set of steps to follow when conducting the review. Consequently, the review process followed guidance provided by Webster and Watson (2002); Petter *et al.* (2008) and Wong *et al.* (2013) on conducting a narrative literature review. Based on insights provided by mentioned authors the review followed the following steps:

1. Identify multiple keywords for searching the literature (CSD functionality, complexity, sophistication, cost system performance, effectiveness…etc.)
2. Determine different literature about the selected topic in numerous online data bases (Egyptian Knowledge Bank (EKB), Google scholar and other online available sources)
3. Categorize and select relevant literature based on the inclusion and exclusion criteria set (inclusion criteria: Academic papers reporting empirical results (quantitative and qualitative) published in various accounting journals during the periods of 1987 to 2020 and excluding all other literature including books, reports, conference proceedings or academic papers out of the time range selected)
4. Synthesize, analyse and explain results based on the conducted literature review

During the first phase of searching literature it was critical to define the main concepts included such as CSD, sophistication, and performance to be able to exclude topics that might not be related to the selected area especially when the studied topic is sometimes collectively included in literature as Management Accounting System. Academic papers were first selected based on the searched keywords in various online databases and reading abstracts to make sure that the paper lies within the criteria selected. The period of selection starts by publication from 1987 which is the first appearance of the Relevance Lost notion until the most recent 2020 to explore the impact of the COVID-19 pandemic. More papers were identified based on citations included in previously selected papers or cited by others. A total of 45 empirical papers were initially selected relating to the selected topics. From this collection, only papers reporting empirical results relating to CSD sophistication and contextual factors were included. Moreover, duplicate papers were excluded along with papers published in non-scientific journals. Any paper that is not explicitly related to the topic of CSD and contextual impact of such design was excluded. The reviewed literature constituted of 25 research papers.

Review of the selected papers resulted in three different streams of literature describing cost system functionality; the first stream of literature included articles depicting the implementation and success factors of emerging cost systems (especially ABC), the second stream of literature included articles related to the structural design choices of different cost systems and finally the third stream of

literature focused on cost system information quality attributes. These three streams would be classified and analysed in the literature review section along with investigated contextual variables in each group.

3. Literature review

3.1 Implementation and success factors related studies

ABC was well introduced academically and in practice as a revolutionary cost system that would increase cost information accuracy through better overhead cost allocation and process view of firm operations. During the following decade of its inception, it was in the centre of attention of different users aiming to reap its expected benefits, but in reality it suffered from lower adoption rates and its usage started to stagnate reporting failure of implementation in different contexts (Pierce & Brown, 2006; Scapens & Bromwich, 2010; Bromwich & Scapens, 2016).

Innes *et al*. (2000) compared ABC adoption rates between 1994 and 1999 based on UK survey of largest firms and found that both the interest in and use of ABC has shown no increase over the study period indicating a loss of popularity and significance. The study reported that ABC was applied for different purposes including Budgeting, Cost Modelling, Cost Reduction and Cost Management, Activity Performance Measurement and Improvement, Customer Profitability, New Product or Service Design and Stock Valuation with varying importance ranking in both surveys. For instance, pricing as a purpose of ABC application increased in importance in 1999 as compared to 1994 results. They further explored the impact of different explanatory variables (mostly behavioural factors) on ABC success including impact of top management support, consultants involved in the implementation, user involvement in the implementation, experience with ABC (as measured by the length of time it has been in use) and the corporate sector of the respondent. Results of the survey indicate that top management support is a key success factor for ABC implementation in both surveys. This study provided inconclusive results relating to ABC adoption rates as in spite of such stagnation, some firms are committed to ABC adoption for more than a decade while others are tentative even to experiment its benefits.

Results of Innes *et al*. (2000) comparative survey supported previous studies depicting the conditions aiding ABC implementation. For instance, Shields (1995) conducted an exploratory study on 143 firms adopting ABC providing empirical evidence on the degree of success with ABC, their implementation strategies and how different contextual variables impacted ABC success. The survey results provided evidence that ABC success is not significantly associated with the use of four technical implementation variables (canned software, custom software, external consultants, and stand-alone vs. integrated system) while several

behavioural and organizational variables are important to explaining variation in ABC success, particularly top management support, link to competitive strategies, link to performance evaluation and compensation, training, ownership by non-accountants, and adequate resources. This study depicted that technical characteristics
(e.g. process design, selection of activities or cost drivers) are not the dominant success factors as previously advocated; employees play an important role in the acceptance and implementation of emerging systems (Krumwiede, 1998). The study called for further research on the design, implementation and use of various cost management systems in different contexts.

In a similar vein, Anderson (1995) conducted a longitudinal cases study in General Motors from 1986 to 1993 for developing a framework for ABC implementation focusing on factors that influence ABC implementation success. This study adopted a more qualitative strategy of inquiry; case study for more in depth analysis of success factors that may have an impact on ABC implementation. Findings of the study provided evidence that different organizational and behavioural factors affected the four stages of implementation (initiation, adoption, adaptation and acceptance) as segmented the study. Organizational factors affecting ABC implementation included top management support and training for the ABC system while other contextual variables included competition, relevance to managers' decisions and compatibility with existing systems. Further research pointed out to the importance of considering actual implementation models in different contexts depicting the actual use of ABC information in actual decision situations. Moreover, analysis of the socio-technical interactions of cost system change grants further research.

From a different perspective, Anderson and Young (1999) investigated the association between evaluations of (ABC) systems, contextual factors, and factors related to the ABC implementation process using interview and survey data from 21 field research sites of two automobile manufacturers in USA. Contextual factors were classified into individual factors and organizational factors which influence ABC implementation process factors (management support and involvement, union support and available resources). ABC implementation success was measured through the usability of the system for cost reduction and process improvement purposes in addition to the improved accuracy of cost information relative to traditional cost system. This study introduced the view of cost system performance evaluation (similar to Foster and Swenson (1997)) rather than just focusing on success factors and stages of the implementation process. They found that both the implementation process and the outcomes of the ABC system are directly influenced by the contextual setting. The study called for inclusion of multi-disciplinary teams perspectives during the development and implementation of the ABC system. Moreover, more experimental research design is recommended to assess the impact of different contextual factors on ABC system evaluation.

Al-Sayed and Dugdale (2016) investigated the extent of Activity Based Innovations (ABI) adoption in UK manufacturing business units. They defined ABI as *"any management accounting practice that uses the concept of 'activities' as its hard core"* this definition broadens the scope of ABC success factors to other practices using the concept of "activities". The study found that certain factors might make a business unit more likely to adopt ABI; considered as drivers of ABI adoption. These factors included perceived relative advantage of the adopted practice, level of overhead and top management support. The study stressed the necessity of redefining other management accounting innovations reflecting their main nature, essence and use aiding future diffusion studies.

Varying adoption rates among different contexts made researchers keener to research ABC success factors in developing countries to uncover cultural impact on system acceptance and use. Liu and Pan (2007) conducted an innovation action research in a Chinese manufacturing company during the ABC implementation period (2001-2003). What distinguishes this study from earlier ones is that it was carried out in a developing country with different cultural impact and it provided a classification of ABC success factors based on evidence from previous ABC literature. The study categorized ABC success factors into 4 groups as depicted in Table 1. This categorization is mostly based on the antecedents of adoption and use of cost management methods first published by Anderson (1995) which were collectively called contextual factors. In spite of existence of some differences between the two categorizations, both cover the majority of contextual factors that might be faced by any organization. Liu and Pan (2007) concluded that sustained top management support is considered the main success factor for ABC implementation. Moreover the involvement of an external consultation team was critical during the initiation phases of ABC adoption. Finally, the participative spirit instilled by ABC team aided in the diffusion of the ABC concepts across the organization. The study called for further research on other contextual factors like the continuous use of traditional financial accounting information in measuring financial performance and cultural related factors that might impact the trustworthiness of the ABC system as a whole.

Nassar *et al.* (2009) conducted a questionnaire survey during 2008 among 88 Jordanian industrial companies that are listed on the Amman stock exchange. The survey findings indicated that 55.7% of the surveyed industrial companies implemented ABC as a result of the increased proportion of overhead costs and diverse products. Moreover the study indicated that adequate training for designing and operating the systems along with advanced information technology are considered critical facilitating factors for ABC implementation. Problems of ABC implementation included mostly technical barriers including high costs of ABC implementation and consulting, difficulties in gathering data on cost drivers or selecting the most appropriate cost driver. These findings are contradicting to earlier studies depicting the importance of behavioural and organizational factors

over technical factors for ABC implementation success (Anderson, 1995; Shields, 1995). The study pointed out to the importance of further research in other sectors of the economy and the relation between ABC costing and financial performance.

Table 1. Classification of ABC success factors

Type	Success factors as depicted in literature
Technical factors	Practical knowledge of applying the conceptual design of an ABC system within an organisational context; which mainly includes the identification of a suitable number of cost drivers and activities, selection of activities that relates to products, linkage between ABC and organisational strategic objectives, and an understanding of the capability of existing computer systems to support ABC systems
Organizational factors	Top management support, adequacy of resource, implementation training, and Structure of organisation and culture.
Behavioural factors	Participative manner in the process of development and implementation of ABC systems and awareness of individual users' behaviour.
Other contextual factors	Competition, task, quality and relevance of cost information to managerial decisions, size of organisation, compensation and reward, general need for change, and culture

Source: Pierce and Brown (2006)

Joshi (2001) examined the extent to which Indian manufacturing companies have adopted certain traditional and recently developed management accounting practices, the benefits received, and their intentions of future emphasis on these practices. The study was conducted through a questionnaire on a sample of 60 large and medium size manufacturing companies. The study showed an increased awareness of the benefits of more developed management accounting practices (including ABC) with still a continuing focus on traditional management accounting technique. This is probably attributed to cultural differences among countries. The author depicts that Indian management generally avoids risk, is quite conservative, and less which makes companies more reluctant in adopting more advanced MAPs. Moreover, lower exposure rate on such new innovations and available information acts as major barriers for diffusion. Finally, the study supports the view of previous literature that company size has a major impact on determining the adoption of newly developed practices. Future research would be directed to finding ways to reduce the lag in diffusion in developing countries.

In an Egyptian context, Van Triest and El shahat (2007) investigated the use of costing information in 40 Egyptian privately held firms in four different sectors. They found that the use and sophistication of costing information in Egypt is limited. The study also indicated that the concept of ABC is completely unknown in Egypt and cost information is mainly used for external purposes (pricing) rather

than internal improvements. Consequently, it is important to gain more insights into the actual needs of Egyptian firms rather than just promoting the adoption of more advanced MAPs. More recently, Mohamed (2013) investigated whether changes in the Egyptian business environment lead to changes in the level of Management Accounting Practices (MAPs), and whether the level of MAPs affects the company's ability to achieve competitive advantages. The study was undertaken through a case study in ***El Araby*** Company, a leading company in manufacturing and marketing of electronic devices and appliances. Findings of the case indicated the use of traditional and modern MAPs alike. More specifically, the company adopts ABC system to provide accurate cost data for pricing and control purposes. Among the main implementation catalysts, as depicted by the company managers, is the realization that some of the product prices were not realistic which is a pivotal tool for facing fierce competition encountered by the company. Moreover, advanced manufacturing technology applied by the company requires accurate and timely information for prompt decision making. What is critical about the findings of this case is the asserting importance of management support for adoption of more advanced costing systems (Abbas & Wagdi, 2014). This supports previous findings that acceptance of advanced costing systems emerges from manager's satisfaction and use of produced cost information, as one manager stated that *"Activity-based costing changes our understanding of cost management in our company".*

Finally, Hussein (2018) examined the adoption, importance and barriers to the implementation of contemporary management accounting practices. The study conducted a survey on a sample of seniors or heads of the accounting departments who have the awareness, experience, knowledge and responsibility for the management accounting practices used in their companies. The sample included a variety of companies of different sizes and industries operating in Egypt. The study concluded that in spite of manager's knowledge of the need of the improved cost information provided by more advanced costing systems like ABC and target costing; they are not adopted as traditional costing practices. This conclusion was justified in terms of surveyed barriers that could limit the implementation of more advanced MAPs as follows (in respective ranking):

1. The time taken to change societal values and practices
2. The high degree of uncertainty avoidance
3. The high cost to implement these advanced practices
4. Lack of financial resources

3.2 Structural design choices

Labro (2006) suggested that ABC cannot be compared to other costing systems as it incorporates non-volume based drivers in contrast to traditional costing systems. This conclusion pointed out to the importance of the cost-benefit trade off necessary when designing and evaluating a costing system, Labro specifically

stated that *"… not to strive for accuracy for the sake of accuracy, but to carefully consider context specific issues in making the decision on the level of accuracy required"*. The level of accuracy is usually related to the type of decision and other sources for soliciting required information. For instance, pricing decisions requires higher levels of accuracy as compared to other. Moreover, when required cost information might be available from other sources (formal or informal), managers can deduce without burdening the cost system with more requirements. Due to such difficulty in comparison, studies have shifted to more general features of sophistication of cost systems. In other words, studies started to classify cost systems by characteristics rather that discrete choices (Wihinen, 2012; Cinquini *et al.*, 2013).

Abernethy *et al.* (2001) examined the implications of product diversity for costing system design choices through conducting case studies in both health care and fabric and textile contexts. Considered as one of the first studies examining cost system structural design choices, it measured cost system sophistication through the number and nature of cost pools and the number and type of cost drivers. They described the complexity of the cost system through a continuum; one end of the continuum represented the simple traditional costing system (i.e. with one cost pool and a volume cost driver) and the other end represented a sophisticated costing system (i.e. number of cost pools, hierarchical cost pools and a variety of hierarchical cost drivers). They included three contextual factors that might impact cost system sophistication; product diversity, production process complexity and manufacturing cost structure. The study findings provided varying evidence based on the context of the study depicting that the relation between product diversity and cost system sophistication is more complex than it is thought. For this reason, the study called for inclusion of a wider variety of contextual factors in future research and analysis of the specific costs and benefits associated with the alternative choices in CSD.

From a similar perspective, Drury and Tayles (2005) examined the extent to which certain contextual factors influence the level of complexity of product costing system design choices in UK companies. Similar to Abernethy *et al.* (2001) study, this study viewed costing system design choices as varying along a continuum according to their level of complexity where it is measured thought three influencing factors: the number of cost pools, the number of different types of cost drivers and the nature of the cost drivers. Seven contextual factors were examined: cost structure, competitive environment, product diversity, degree of customization, size of the organization, importance of cost information for decision-making and corporate sector within which an organization operates. The study found that the proportion of indirect costs within the cost structure, the intensity of competition and the importance of cost information for decision-making are not significant variables in influencing the choice of cost systems. These findings came contradicting to previous research depicting that the

percentage of overhead is a major determinant of cost system design. Moreover commercial and financial firms possess higher cost system complexity as compared to manufacturing firms justified by higher proportion of overheads (Brignall, 1997). Future research was directed to more utilization of case study research examining the lower adoption rates of more sophisticated cost systems in different contexts and the benefits of incremental investment in more complex cost systems.

Al-Omiri and Drury (2007) extended previous research on cost system sophistication through examining the extent to which potential contextual factors influence the characteristics of product costing systems. The study didn't focus only on the adopters versus non adopters of ABC criteria as a measure of cost system sophistication it further included three other measures: the number of cost pools (centres) used in the first stage of the two-stage allocation process, the number of different types of second stage cost drivers and direct versus absorption costing. The study investigated the relation of nine contextual variables to cost system sophistication as follows: importance of cost information, product diversity, cost structure, intensity of the competitive environment, size, quality of information technology, extent of uses of innovative management accounting techniques, extent of use of lean production techniques and business sector. It was found that higher levels of cost system sophistication were positively associated with importance of cost information, extent of use of other innovative management accounting techniques, intensity of the competitive environment, size, extent of use lean production techniques and the type of business sector. On the other hand, no association was found between level of cost system sophistication and cost structure, product diversity and quality information technology. The insignificance of product diversity and cost structure seemed surprising as these two variables are usually considered having a major influence on CSD. The study pointed out that such findings might be attributed the use of simplistic measures in the questionnaire. Moreover, it was thought that case study as a strategy for enquiry would be more appropriate for this kind of research to allow for deeper insights relating to CSD. More specifically, the authors suggested that future research should adopt the "interaction approach" to fit by incorporating an appropriate outcome measure as the dependent variable (e.g. firm performance). They also recommended considering other variables that would most probably impact CSD such as top management support, resistance to change by preparers and users of accounting information, lack of relevant employee's skills and the lack of a perceived need by senior managers or the management accounting function to develop more sophisticated systems.

Brierley (2008) provided a different definition for product costing systems sophistication based on a cross-sectional field study of different manufacturing industries in UK. He provided evidence -based on manager's perception- that sophistication definition may vary according to context, management perspectives and purposes. Management accountants provided 16 different definitions for

product costing sophistication; the three main definitions were expressed in terms of overhead assignment, the inclusion of all costs in product costs and the understandability of the product costing system. Such assertions can be thought of as characteristics or attributes defining a cost system design. More specifically, such definitions or perceptions tackle manager's desired changes in less sophisticated systems. This study tackles the fact that previous studies focused on CSD sophistication in relation to accuracy of overhead allocation without any reference to practice. Results of the study suggest that sophistication is not only reflected in the technical aspects of a cost system but is also related to the usability and appropriateness of cost information provided. Replication of the study results is required in different countries to be able to compare and contrast sophistication definitions across different contexts and industries.

Responding to the calls of previous research relating to describing the characteristics or attributes of costing systems that affect their performance, Schoute (2009) examined the associations between cost system complexity, purposes of use, and cost system effectiveness using a survey on Dutch manufacturing firms. Two measures were used to operationalize cost system complexity: a) number of cost pools and cost allocation bases, b) nature of cost pools and cost allocation bases. Nine widely used purposes of cost systems were examined either relating to cost management or product planning purposes. Finally, cost system effectiveness was measured utilizing two proxies: a) cost system intensity of use and b) cost system satisfaction. The influence of a number of environmental, organizational and technological factors was controlled for, since these factors may influence not only cost system complexity and purposes of use, but also cost system intensity of use and satisfaction. The study indicated that alignment between CSD (i.e. level of complexity) and its purpose of use leads to more effective cost systems. More specifically, when cost systems are used for product planning purposes at higher levels, cost system complexity would negatively affect cost system intensity of use and satisfaction. On the contrary, when cost systems are used for cost management purposes at higher levels, cost system complexity would positively affect cost system intensity of use. Additionally, cost system complexity and purpose of use have a joint effect on cost system effectiveness. The author called for further research to confirm and extend existing findings in different contexts.

In developing countries, Ismail and Mahmoud (2012) examined the extent to which organizational and environmental factors influence the cost systems design in Egyptian manufacturing firms. They examined four main contextual factors and their subsequent impact on manufacturing performance as follows: product diversity, competitive environment, cost structure and importance of cost information. Three measures were used as proxies for determining the level of cost system sophistication as follows: ABC/ Non- ABC adopters, number of cost pools and number of cost drivers. Manufacturing performance was measured in terms of

quality, time and cost related to the manufacturing process. Results of the study supported previous literature indicating that the use of highly sophisticated cost systems in Egyptian manufacturing firms is limited, simple and complex traditional systems are widely used, and very few firms adopting simple Activity-Based Costing (Van Triest & El shahat, 2007; Mohamed, 2013). The study also provided evidence that the sophistication level of cost systems is positively associated with the importance of cost information, while no association was found with product diversity, intensity of the competitive environment and cost structure. An important conclusion of this study was the assertion that improvements in manufacturing performance resulting from reducing cycle and lead times, improving product quality and reducing costs is associated with an effective selection of cost system. Future research would be required to investigate differences between the private and public sector of Egyptian firms in terms of the diversity of contextual factors that might influence cost systems sophistication level, and test the impact of highly sophisticated cost systems on manufacturing performance using longitudinal analysis.

Most recently, Humeedat (2020) examined the impact of certain environmental factors on cost system design in industrial corporations listed in Amman Stock Exchange after the COVID-19 pandemic. The study pointed out to the importance of studying this topic repeatedly to explore other contextual factors that might impact CSD. CSD was measured based on questions focusing the type of cost classification adopted, number and nature of cost pools and cost drivers. The study investigated the impact of 4 contextual factors on CSD as follows: product diversity, relevance of cost information, technological changes and triggered exceptional operational losses. It was important to highlight the impact of COVID-19 spread on the operational process of industrial organizations. As suggested by the author, COVID-19 is pushing organizations to utilize more advanced information and manufacturing technologies to be able to operate under the prevailing economic conditions. Moreover, this study introduced a new contextual factor -triggered exceptional operational losses- which was defined as *"the operational losses that result from the interruption of the production process, temporarily or permanently, due to internal or external triggered exceptional events resulting from economic, political or health circumstances"*. The interruption of the production process due to the spread of COVID-19 have led to many operational losses which consequently was required to be reduced through a variety of corrective actions including cost reduction strategies. This would definitely have an impact on existing CSD. The results of this study revealed that cost system design was positively affected by technological changes, triggered exception operational losses, and relevant cost information, while no relationship was found with product diversity. Recommendations of the study were focusing on investigating the ability of cost systems to mitigate the economic effects resulting from the spread of COVID-19 and its impact on other facets of the operational process.

3.3 Critical Attributes of CSD

Previous studies have mainly focused on system quality as related to the technical ability of a cost system to provide better information. Cost systems mainly provide cost information for mangers to make decisions, therefore evaluating information quality produced by a cost system is considered to be a reflection of its sophistication. Following this perspective, Pizzini (2006) examined the association between cost-system functionality, manager's beliefs about the relevance and usefulness of cost data, and actual financial performance using a sample of 277 US hospitals. The study examined four critical attributes or elements of CSD as follows: level of detail, classify costs according to behaviour, frequency of cost reporting and variance analysis. It was proposed that a "better" cost system would be able to provide more detailed information about different cost objects, classify costs according to behaviour, provide cost reports on regular bases and upon request and calculate different types of variances. An important conclusion of this study is that higher functionality of cost systems might actually hinder firm performance. This can be evident in cost information overload, higher costs of extensive cost systems and production of irrelevant cost information. Findings of the study indicated that managers believe that cost systems with higher attributes would provide more relevant and useful information in similar contexts. Surprisingly, only the attribute of detail was significantly associated with financial performance implying that cost information was not appropriately utilized by managers or that hospitals have not adjusted their cost systems to cope with the increased information needs. The study called for more extensive research on cost system functionality in different contexts.

Responding to the calls of assessing CSD in different contexts, Pavlatos and Paggios (2009) examined the relationship between cost system functionality and contingent factors in the hospitality industry through conducting a survey on a sample of 100 leading hotels enterprises in Greece. CSD functionality was assessed through five critical attributes similar to those adopted by Pizzini (2006) with the inclusion of *"accuracy of the cost data"* as the fifth attribute. The study examined the impact of six contextual factors on the functionality of CSD including extent of use of cost data, low cost strategy, size, level of competition, number of services variants, and membership of multinational chains. The study concluded that the level of system functionality used in the hospitality industry low. Moreover, the majority of cost systems followed by the hotels do not provide quality cost data. Similar to Pizzini (2006) findings, hotels have not yet adjusted their cost systems to withstand the impact of changing environment. Cost system functionality was found to be positively associated with the extent of use of cost data and low cost strategy while no significant association was found with the remaining contingent variables. Further research was required for incorporating other important contingent variables that might influence CSD and examining the association between cost system functionality and performance.

In a different context, Foong and Teruki (2009) investigated the relationship between cost-system functionality and the performance of oil-palm enterprises in Malaysia. Cost system functionality was measured through the level of cost details, relevance of cost information provided and timeliness. The performance of cost system was assessed through manager's perceived usefulness of cost information. In spite of the existence of a positive association between cost system functionality and performance, they found that performance is enhanced through the provision of more relevant and timely information rather than detailed information compared to evidence provided by Pizzini (2006). Different conclusions would probably be a result of different contexts and business nature. An extension to the study findings, the authors found that manager's perception of usefulness of cost information only partially mediate the relation between cost system structure and non-financial performance considering the oil industry conditions and market prices. The study called for investigating the efficacy of cost systems in different decision making environments.

Cohen and Kaimenaki (2011) provided insights into the associations among cost accounting systems structure characteristics and cost information quality properties using a sample of 119 manufacturing company in Greece. Cost system structure characteristics were measured through the four critical attributes introduced by Pizzini (2006). Eight dimensions of cost information quality were examined to identify the effectiveness of CSD including: relevance, accuracy, reliability, timeliness, usability, up-to-datedness, compatibility with decision makers' needs and thoroughness suitable for decision-making purposes. It was found that the cost accounting structure in terms of detailed information existence, variance calculation and frequency in reports preparation exerts an influential role on the relevance, accuracy, timeliness, usability, compatibility, up-to-datedness, reliability and thoroughness of information for decision-making purposes. On the contrary, the systems' ability to disaggregate costs according to behaviour and to generate customized reports was not found to be statistically significantly associated with information quality. One of their main findings was that managers recognize the importance of receiving sophisticated cost information during the decision-making process. In other words, cost system design explains the quality of cost information produced and hence, a reflection of the perception of the usability of cost information. The study also called for more research on the effects of cost system design choices in quantifiable measures of firm performance to better translate manager's perceptions.

Finally, Uyar and Kuzy (2016) investigated the mediating effect of management accounting practices (MAPs) upon the association between CSD and financial performance in Turkey. The study adopted the five critical attributes from Pavlatos and Paggios (2009) to measure CSD. The findings indicated that cost system design alone does not impact firm performance. Their findings (parallel to the findings of Pavlatos and Paggios (2009) also suggested that incurring high costs for

the establishment of a more sophisticated cost system might be justifiable, on condition that the firm will utilize the obtained cost data through various decision-making tools; otherwise there is no point in bearing the cost of building such a system. Such findings would be beneficial for practioners who evaluate CSD from a more pragmatic perspective.

4. Results and synthesis of the literature review

In this section, we offer findings from our qualitative literature review. As defined in our scope, the aim is to find out if the literature has effectively provided conclusive evidence on the relation between CSD performance and different contextual variables. Also, the literature review evaluated the different measurement proxies used in assessing CSD sophistication within the period between 1987 and 2020. Analysis of the results of the literature review would be classified into 3 categories depicting the 3 emergent streams of literature. A summary of the reviewed papers in the three streams of literature respectively is provided in the Appendix. Analysis of reviewed articles provided evidence on the importance of behavioural and organizational factors necessary for better system performance. The most cited organizational factor necessary for adoption and implementation success of ABC was top management support and training while other behavioural factors included continuous employee commitment and participation. The stagnating adoption and diffusion rates of ABC systems pointed out to being viewed as a fashion and fad state of highly publicised method for better overhead allocation. Table 2 illustrates the characteristics of reviewed articles relating to the geographical concentration of conducted studies, adopted research methods and theoretical perspectives. It was found that most studies were concentrated in developed countries as compared to developing countries. The most utilized research method was the survey method identified in 62% of the reviewed articles followed by case studies identified in 15% of the articles. Experimental and mixed methods were very rare or non-extent. Contingency theory with a selection fit dominated the reviewed papers.

Analysis of the second stream of literature focused on identifying cost system features of sophistication. Studies have adopted the structural design choices perspective to evaluate CSD sophistication/complexity so as to be able to compare various systems on a wider scale. Number and nature of cost pools and cost drivers were among the most utilized dimensions of CSD sophistication which were usually viewed as a continuum from lower to higher sophisticated cost systems rather than a discrete choice. This stream of literature focused on the technical properties reflected by the system in relation to how overhead cost were classified, allocated and assigned to cost objects. In other words, studies focused on system quality or the characteristics of information systems. Contextual variables were more diversified and related to the advanced manufacturing and technological

developments introduced. Studies are more concentrated in developed countries constituting 71% of the reviewed articles as compared to 29% in developing countries. Survey method was conducted in 5 out of the 7 papers and the contingency theory is still dominating CSD literature with a selection fit except for one paper (Ismail & Mahmoud, 2012), that considered the impact of CSD on firm manufacturing performance.

Table 2. Characteristics of reviewed articles in the first stream of literature

	Number of articles (13)	Frequency (approximated)
Geographical concentration	7	54%
Developed countries	6	46%
Developing countries		
Research method		
Survey	8	62%
Case study	2	15%
Interview and survey	2	15%
Action research (interviews, documentation and observation)	1	8%
Theoretical perspective		
Contingency theory		
Selection fit	8	62%
Interaction fit	0	0
Not specified	4	30%
Multiple theory	1	8%

The third stream of literature focused on the information quality produced by different CSDs. Information quality was viewed in terms of the quality of the output of cost information systems relating to accuracy, detail, classification, variance analysis and frequency of reporting (critical attributes). Studies provided inconclusive findings related to the impact of CSD critical attributes on firm performance. Studies turned to focus on interaction fit to some extent as compared to previous literature. Still, the focus is on survey based research as compared to more qualitative approaches. Developing countries started to have a bigger share of CSD research with more variety in included countries.

Table 3. Characteristics of reviewed articles in the second stream of literature

	Number of articles (7 papers)	frequency
Geographical concentration		
Developed countries	5	71%
Developing countries	2	29%

Research method		
Survey	5	72%
Case study	1	14%
Crossectional-field study	1	14%
Theoretical perspective		
Contingency theory	6	86%
Selection fit	1	14%
Interaction fit		

Table 4. Characteristics of reviewed articles in the third stream of literature

	Number of articles (5 papers)	frequency
Geographical concentration	1	20%
Developed countries	4	80%
Developing countries		
Research method		
Survey	5	100%
Case study	0	0
Theoretical perspective		
Contingency theory		
Selection fit	2	40%
Interaction fit	2	40%
Descriptive/analytical approach	1	20%

5. Discussion and conclusion

This review investigated how CSD was evaluated in relation to different contextual factors as depicted in cost accounting literature during the period between 1987 and 2020. The review focused on the most relevant CSD literature rather than management accounting control systems in general. First of all, it can be concluded that extant cost accounting literature didn't provide a holistic consistent measure for CSD success. Studies used different proxies to assess CSD sophistication/complexity in relation to its adoption and implementation in different contexts. A major reason for this is the definition of sophistication as a concept. Different studies have used the term complexity, sophistication and functionality to describe different aspects related to CSD. Consequently, each study described CSD from a different point of view leading to the creation of a non-coherent body of knowledge. For this reason, a certain distinction should be drawn on specifying what each terminology means so as to be linked to how CSD should be described. Wihinen (2012) distinguished between the three terminologies depicting that sophistication is a wider terminology encompassing both complexity (technical structure) and functionality (practical relevance).

The inconclusive findings relating to the impact of CSD sophistication on firm performance was depicted by Laitinen (2014) suggesting that the impact of any management accounting changes or information system change is not straight forward and might be difficult to be identified due to various reasons including: a) the positive and negative effect of management accounting or information system change might offset each other making the net effect insignificant, b) the lagging effects of management accounting and information system change and c) the bidirectional nature of the relation between such changes and performance, making performance a potential contextual variable. These reasons made most of the studies follow a selection approach to fit of contingency theory rather than an interaction approach as postulated by Al-Omiri and Drury (2007).

This review provides similar perspective of management accounting change literature as introduced by Modell (2007). He classified research into two categories: factor studies and process-oriented studies; where factor studies focus on contextual factors that motivate or hamper the effective implementation of various management accounting practices and explain differences in the design and use of such systems. Contingency theory is considered the main theory used in such studies. On the other hand, process-oriented studies focus on the social and political dynamics of the implementation process rather than the functionalist technical perspective advocated by factor studies. Institutional theories are widely used with such studies. This review provided similar findings depicting that CSD literature is mostly dominated by factor studies as compared to process oriented studies inspite of the plausible justifications provided by the later. For instance, Pizzini (2006) argued that institutional theory suggests that hospitals may adopt refined cost systems simply to conform to societal expectations of acceptable practices (external legitimization). This implies that institutional interactions might impact CSD and management accounting practices and hence performance.

CSD sophistication/complexity has been measured from different perspectives in literature; these perspectives can be viewed as dimensions of information systems success. The D&M updated model of information system success introduced by DeLone and McLean in 2003 provided a more comprehensive view for evaluating the performance of information systems in general (Petter *et al*., 2008). Such model can be utilized in future research for analysing system relevance and usability considering the interdependence of such dimensions. The model provided six dimensions for information system success measurement as follows: System quality, Information quality, Service quality, System use, User satisfaction and Net benefits.

The model implies that system, information and service quality would impact system use and user satisfaction which in turn would influence net benefits. Extant literature have focused on system quality and information quality as related to a specific CSD neglecting service quality, most probably due to the perception that service quality is related to the organization and its staff rather than the system

itself. Moreover, the model proposes a bidirectional relationship between the intention to use the system and user satisfaction and between net benefits and both intention to uses and user satisfaction. Such relationship is not depicted in cost accounting literature inspite of its appealing practical implications relating the actual use of the cost system.

This review contributed to the CSD literature in many ways. First, it categorized reviewed articles into different streams of literature to highlight the focus of each group of papers, different contextual impacts and characteristics of reviewed papers. Second, based on the results of the review, limitations and gaps in different aspects of literature like the domination of the contingency theory, survey methods for data collection and concentration of studies in developing countries were identified. As a result, this review opens chances for more extensive future research on the determinants of CSD sophistication and its impact on cost information usability and relevance based on models such as the DeLone and McLean model. Moreover future research could link CS performance with firm performance rather than focusing merely on the impact of different contextual variables on CS effectiveness. This review is a qualitative review of relevant CSD literature, it is limited by the researcher's ability to classify and analyse existing studies rather than providing a more systematic analysis of all related studies.

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Appendix: summary of reviewed articles
First stream of literature

Second stream of literature

Paper reference /country	Paper objective	Theory	Research method	Main findings
(Pizzini, 2006) / USA	examining the association between cost-system functionality, manager's beliefs about the relevance and usefulness of cost data, and actual financial performance	Contingency theory (selection fit)	Survey of 277 US hospitals	Cost systems with higher attributes (level of detail, classify costs according to behaviour, frequency of cost reporting and variance analysis) would provide more relevant and useful information in similar contexts. Only the attribute of detail was significantly associated with financial performance
(Pavlatos & Paggios, 2009) / Greece	examining the relationship between cost system functionality and contingent factors in the hospitality industry	Contingency theory (selection fit)	Survey on a sample of 100 leading hotels enterprises	The level of system functionality used in the hospitality industry is low. The majority of cost systems followed by the hotels do not provide quality cost data. Cost system functionality was found to be positively associated with the extent of use of cost data and low cost strategy while no significant association was found with the remaining

Paper reference /country	Paper objective	Theory	Research method	Main findings
				contingent variables
(Foong & Teruki, 2009) / Malaysia	investigating the relationship between cost-system functionality and the performance of oil-palm enterprises	Contingency theory (interaction fit)	Survey of oil palm enterprises located in Sarawak	Performance is enhanced through the provision of more relevant and timely information rather than detailed information
(Cohen & Kaimenaki, 2011) / Greece	Investigating the associations among cost accounting systems structure characteristics and cost information quality properties	Descriptive analytical approach	Survey from 119 manufacturing company in Greece	Cost system design explains the quality of cost information produced and hence, a reflection of the perception of the usability of cost information
(Uyar & Kuzey, 2016) / Turkey	investigating the mediating effect of management accounting practices (MAPs) upon the association between CSD and financial performance	Contingency theory (interaction fit)	Survey of high-ranking administrators in different industrial sectors	Cost system design alone does not impact firm performance. sophisticated cost system design might be justifiable, on condition that the firm will utilize the obtained cost data through various decision-making tools

Third stream of literature

Paper reference /country	Paper objective	Theory	Research method	Main findings
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