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# TOWARDS A CRM AND SCM BENEFITS MEASUREMENT MODEL

*Research-in-Progress*

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## **Abstract**

*Organizations invest heavily in Customer Relationship Management (CRM) and Supply Chain Management (SCM) systems, and their related infrastructure, presumably expecting positive benefits to the organization. Assessing the benefits of such systems is an important aspect of managing such systems. Given the substantial differences between CRM and SCM systems with traditional intra-organizational applications, existing Information Systems benefits measurement models and frameworks are ill-suited to gauge CRM and SCM benefits. This paper reports the preliminary findings of a research that seeks to develop a measurement model to assess benefits of CRM and SCM applications. The a-priori benefits measurement model is developed reviewing the 55 academic studies and 40 practitioner papers. The review of related literature yielded 606 benefits, which were later synthesized into 74 mutually exclusive benefit measures of CRM and SCM applications arranged under five dimensions.*

**Keywords:** SCM, CRM, ES, Benefits, Content Analysis

## Introduction

In recent time, organizations are implementing Customer Relationship Management (CRM) and Supply Chain Management (SCM) software solutions, to achieve a range of business benefits (Richards and Jones 2008). According to Gartner Research Group, the worldwide SCM market grew 17.6% in 2007, leading to US\$5.9 billion in license and maintenance revenue (Eschinger 2008), while the CRM market enjoyed a record growth of 23% in 2007, with total software revenue nearing US\$8.1 billion (Mertz 2008). The steady growth of the CRM and SCM systems market is evident in the spending for 2008 in Europe, the Middle East and Africa where it is estimated at 11.1 billion Euros (Pang 2008). However, Hee-Woong et al. (2006) and Wei et al. (2007) argue that organizations are struggling to understand and reap benefits of such systems, emphasizing the importance of understanding their benefits.

This research seeks to develop a benefits measurement model for CRM and SCM systems that has both academic and practical implications. This *research-in-progress paper* reports findings of the first phase of this research, by introducing the a-priori measurement model. The a-priori model is developed using the 'reported benefits' of CRM and SCM applications in both academic and practitioner outlets. Given that such benefits are multi-dimensional, the goal of this study is to derive a robust, economical and validated benefits measurement model tested in multiple methods, such as focus groups and survey. Such a validated and widely-accepted measurement model has both academic and practical value extending the systems evaluation domain of Information Systems (IS) into two new important contexts of CRM and SCM systems.

Despite the major contributions by well-publicized research on IS success measurement models (e.g. DeLone and McLean 1992; Gable et al. 2008) in developing our understanding of system benefits, there is a dearth of research on studies evaluating 'inter' organizational application systems benefits. Most prior IS evaluation research concentrates on 'intra' organizational systems and cannot be readily employed for measuring 'inter' organizational information systems like CRM and SCM systems.

Moreover, at a macro level, despite the functional differences between CRM and SCM systems, benefits of CRM and SCM systems remain largely similar. Herein, considering that both systems have an inter-organizational focus, it is argued that it is appropriate to develop a single benefits measurement model for both CRM and SCM systems at a conceptual level. However, considering the early stage of this research, the researchers are open to the possibility of developing individual benefit measurement models for each of the applications, if the benefits are found to be considerably different.

The remainder of the paper is organized in the following manner. The paper begins with a literature review, providing definitions for CRM and SCM systems, and summarizing the well-validated IS success models and their gaps in related to CRM and SCM systems. Next, the two-phased research design and the methodology are discussed. Then, the benefits of CRM and SCM applications are mapped into IS-Impact model. The following section introduces the a-priori CRM and SCM benefits measurement model. Lastly, the paper concludes with a summary and a research outlook.

## Literature Review

### *CRM and SCM Systems*

Customer Relationship Management (CRM), is a systematic process to manage customer relationship initiation, maintenance, and termination across all customer contact points in order to maximize the value of the relationship portfolio (Reinartz et al. 2004). A CRM system will assist the organization by providing infrastructure that facilitates long-term relationship building with customers (Hendricks et al. 2007). It is supported by both technology and process that is directed by strategy and is designed to improve business performance in an area of customer management (Richards and Jones 2008). Some examples of the functionality of CRM systems include (but not limited to): sales force automation, data warehousing, data mining, decision support, and reporting tools (Katz 2002).

Supply Chain Management (SCM) on the other hand is a concept and practice that encompasses planning and management of activities involved in sourcing and procurement, conversion. It also includes all logistics management activities as well (Ballou 2007). According to Lambert and Cooper (2000), SCM systems provide for its adopters, an integration of key business processes from end user through original suppliers that provides products,

services and information that add value for customers and other stakeholders. Such systems use finite capacity planning algorithms that do not require iterative adjustments to the master schedule (Raman and Singh 1998), and real-time planning capabilities allow firm to react quickly to supply and demand changes.

### ***Important Models and Frameworks of IS Success***

In the last two decades, there has been a strong focus on research assessing the success of an information system (e.g. DeLone and McLean 1992; Gable et al. 2008; Myers et al. 1997; Shang and Seddon 2002). The three most prominent models are discussed herein are the: (1) The DeLone and McLean (1992) model, (2) ERP benefits framework and the (3) IS-impact measurement model. Despite a thorough search of related literature, there exists no statistically validated CRM/SCM success/benefits measurement model/framework to the best of the authors' knowledge. However, the three listed models (particularly the IS-impact measurement model) provide this research with a vital theoretical foundation.

The first and one of the most widely cited IS-success model is DeLone and McLean (1992) model. Based on two communication theories proposed by Shannon and Weaver (1963) and Mason (1978), this model employs six distinct categories or aspects of information systems and gave the relevant explanations: (1) systems quality, (2) information quality, (3) information use, (4) user satisfaction, (5) individual impact, (6) organizational impact. DeLone and McLean not only provided the causal relationship between the six dimensions, but also summarized the salient measures for each of this dimensions from previous MIS studies. In the following decade, this model has been applied, validated, criticized or modified by many researchers (e.g. Jiang 1999; Karahanna et al. 1999; Li 1997; Myers et al. 1997; Torkzadeh and Doll 1999). Despite its many adaptations, the DeLone and McLean model has never been extended to CRM and SCM system evaluations.

Shang and Seddon (2002) proposed the ES benefit framework for summarizing benefits in the years after ES implementation. This benefit framework was consolidated by competing in-depth case studies of four Australian utility companies. The Shang and Seddon framework classifies potential benefits of Enterprise Resource Planning (ERP) systems into 25 lower level measures organized around five dimensions – operational benefits, managerial benefits, Strategic benefits, IT infrastructure benefits, and organizational benefits. This framework is yet to be operationalized using a survey instrument.

The IS-impact measurement model (2008) was derived in the context of Enterprise Systems, which was generalized to the contemporary IS domain. Since its inception, it has widely accepted and cited as an evaluation tool to gauge success of a system. The IS-Impact model consists of 37 measures arranged under four dimensions: Individual Impact, Organization Impact, System Quality, and Information Quality. Gable, Sedera and Chan (2008) stringently treated both the model dimensions and the sub-constructs as a formative index rather than implying causality amongst the dimensions. The authors also argue for its extensive attention to the model completeness, mutual exclusivity of the measures, and the necessity of all dimensions and measures when employing the model to measure system success.

From the outset it was clear that the three aforementioned models are not entirely appropriate for an evaluation of CRM/SCM systems benefits, with the perceived lack of measures to adequately gauge the level of success of CRM and SCM applications. However, this study adopted much through the study approaches, measures and dimensions of the prior IS-success studies. For example, the web content analysis approach of the ERP benefits framework is analogous to first phase of the research reported herein. The DeLone and McLean model and the related literature provided insights on how a model can be extended into other systems domains. The IS-impact measurement model provides a much needed foundation for this research with its measures and dimensions which were derived in the context of Enterprise Systems. These purported mutual exclusive measures and dimensions provide the starting set of measures and dimensions for this study.

## **Research Design**

This study follows the research cycle proposed by MacKenzie and House (1979) and McGrath (1979) in instrument development and includes two main phases. The (1) exploratory phase seeks to develop a hypothesized a-priori model, which the (2) confirmatory phase seeks to test the hypothesized measurement model against new data gathered.

In this research the exploratory phase is qualitative in nature and employs content analysis techniques. Its purpose, akin to the function phase of Burton-Jones and Straub (2006) approach, is to identify the a-priori salient dimensions and measures for the proposed measurement model for the context of CRM and SCM systems, and to ensure the model completeness and an appropriate choice of measures and dimensions. Herein, the study attempts to identify a-priori measures and dimensions from the existing literature, based on conceptual arguments. This paper discusses the derivation of the a-priori model.

The confirmatory phase entails a testing the a-priori model developed through the exploratory phase using a large survey of CRM/SCM users of a market leading CRM/SCM vendor. The confirmatory phase is in-progress at the time of the publication.

## **Exploratory Phase**

The exploratory phase employs guidelines similar to those of the Shang and Seddon (2002) ERP Benefits Framework. Ensuring model completeness, this study too first identifies a wealth of benefits of CRM and SCM appeared in both academic and commercial outlets. Next, the gathered benefits are synthesized using guidelines of content analysis.

Content analysis has been defined as a systematic, replicable technique for compressing many words of text into fewer content categories based on explicit rules of coding (Krippendorff 1980; Stemler 2001; Weber 1990). It is a widely used in qualitative research technique now, and has three distinct approaches: conventional, directed, or summative (Hsieh and Shannon 2005). Conventional content analysis, also described as inductive category development, is generally used with a study design whose aim is to describe a phenomenon. This type of design is usually appropriate when existing theory or research literature on a phenomenon is limited. Researchers avoid using preconceived categories (Kondracki and Wellman 2002), instead allowing the categories and name for categories to flow from the data. Directed content analysis, as a deductive category application, is often used when existing theory or prior research exists about a phenomenon that is incomplete or would benefit from further description. The goal of directed content analysis is to validate or extend conceptually a theoretical framework, model or theory. Summative content analysis starts with indentifying and quantifying certain words or content in text with the purpose of understanding the contextual use of the words or content. This quantification is an attempt to infer meaning rather than to explore usage, so it goes beyond mere word counts to include latent content analysis, which refers to the process of interpretation content (Holsti 1969). This research, we employ the *conventional content analysis* given its exploratory nature.

### ***Identifying a Pool of Benefits of CRM and SCM***

The novelty of the research phenomena required that the research identifies CRM and SCM benefits using both academic and commercial (practitioner) press between year 2000 and 2008. The main academic journals canvassed for stated CRM and SCM benefits include: MISQ, ISR, CACM, I&M, DSI, JMIS, MS. Moreover, ICIS and AMCIS conference publications were also scanned. The main keywords employed in the academic search were restricted to a title and body text search of (1) CRM and (2) SCM. The practitioner material was scanned using the vendor stated 'success stories'. The search of evidence identified 55 academic studies and 40 success stories (see appendix A for the references and the names of the successful cases).

All 95 'sources of evidence' was then scanned for the stated benefits of CRM and SCM applications. This process yielded a total of 606 benefits statements relating to CRM and SCM systems<sup>1</sup>. We also noted that approximately 90% of the stated benefits were common to both CRM and SCM applications.

### ***Synthesizing the Citations***

Synthesizing this wealth of qualitative evidence into a useful, meaningful, and coherent classification of benefit measures and dimensions is a critical and complex stage of the study. The objectives of this exercise were to develop a model that is (1) simple and generalizable beyond the current study, while also being (2) intuitive to the study respondents. These two aims at times were diametrically opposed.

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<sup>1</sup>The page restriction in this submission prohibits us from including all citations. Citations are available from the contact author.

The synthesis procedure attempts to reduce the identified benefits by removing overlapping measures to attain mutual exclusivity and parsimony. To avoid personal bias, the synthesis process was conducted by two experts on CRM and SCM systems, following four simple guidelines. The guidelines employed in synthesis include: (1) When two benefit statements are identical, they were merged into a single statement, (2) When two benefit statements employ the same keyword they were merged into a single statement. (3) When two benefit statements use different keywords, but have a similar meaning, a list of synonyms were considered using a thesaurus. Measures where the replaced synonyms are similar, two statements were merged into a single citation. (4) When two statements use diametrically opposed of the same phenomenon, where a benefit on one statement is stated as an issue in the other, two statements were merged only taking the positive meaning of it.

The guidelines above allowed the three coders to follow the same logical rational when synthesizing the 606 citations. The synthesis process identified 74 unique benefits of CRM and SCM systems.

## **Mapping the Citations into IS-impact Measurement Model**

The literature suggests two main approaches in developing an a-priori model: (1) a ‘bottom-up’, data driven, open coding approach or (2) a ‘top-down’, structured coding, framework approach (Gable et al. 2008). The top-down approach employs deduction, and starts with a logical framework or model to categorize the responses, while the bottom-up approach employs induction, starting with the data in hand, that is arranged into a logical classification. Given the relative advantages and disadvantages of these approaches, it was decided that the top-down approach first be attempted, using Gable et al.’s IS-Impact model as the theoretical foundation, and that a bottom-up approach only be adopted given pool fit of the data with the chosen model.

Having identifying the salient benefits of CRM and SCM systems to develop a benefits measurement model, the 74 citations were mapped into the dimensions of the IS-impact measurement model. The main objectives of the mapping exercise are two-folded: (1) to provide a theoretical underpinning for the intended research CRM and SCM systems benefits measurement model, and (2) to demonstrate the possible in/adequacies of existing IS evaluation models (where IS-impact measurement model is an example of) to gauge the benefits of CRM and SCM systems.

Thus the mapping exercise was conducted by an experienced researcher (10+ years of IS research experience) and a research student. To ensure the reliability of the mapping exercise, the research team employed the method of Inter-coder reliability (Krippendorff 1980). Inter-coder reliability is a method that has been commonly employed by qualitative researchers (Burla et al. 2008; Hellreich 1995; Hughes and Garrett 1990; Kurasaki 2000; Vikstrom 2007; Yeaton and Wortman 1993), where the inter-coder reliability measure gauges the agreement between multiple coders. Agreement can be used to measure the reliability of the coders as instruments to identify and mark themes in a text, or as a proxy for the validity of the constructs that emerge from the data (Ryan 1999). To make valid inferences from the text, it is important that the classification procedure be reliable in the sense of being consistent: Different people should code the same text in the same way (Weber 1990). Thus the mapping process, akin to steps proposed in Haney et al. (1998) was repeated till reliability (i.e. a 95% agreement or 0.8 for Cohen’s kappa) of mapping was reached.

Table 1 exemplifies how a subset of our 74 benefits map into the Gable et al.’s IS-impact dimensions (Individual-Impact, Organizational-Impact, System-Quality and Information-Quality). It is evident that most CRM / SCM benefits can easily be mapped into the existing dimensions of the IS-impact model. However, a substantial number of benefit citations did not easily map into the existing dimensions. A key observation herein is that the unmapped citations are largely related to the benefits associated with external parties (e.g. customers, suppliers, channels and the whole supply chain). Given the citations are strongly emphasizing the linkages between customers, suppliers and other channels, this dimension is tentatively labeled as “Inter-organizational integration”.

Weston (2003) provides further justification for the new dimension where he differentiates traditional ES with CRM and SCM systems demonstrating differences between the stakeholders. The CRM and SCM applications have a primary objective of linking the external stakeholders with the organization. Given this differentiation between traditional Enterprise Systems and CRM/SCM applications, we argue that the new benefit dimension addresses benefits that are unique to CRM and SCM systems. Moreover, the inclusion of the new dimension and its citations suggest that the IS-impact measurement model is inadequate in measuring benefits of extended Enterprise Systems such as CRM and SCM systems.

Table 1. Mapping Benefits of CRM and SCM Systems into the IS-Impact Model		
IS-Impact Dimensions	IS-impact Measure	Example citation/s
Individual-Impact	Decision effectiveness	Enhance better decision making
Organization-Impact	Organizational costs	Improve financial efficiency
	Staff requirements	Reduce human resources
	Cost reduction	Cost reduction, Reduce system maintenance costs
	Overall productivity	Increase overall productivity, Reduce order errors
	Product/service quality	Improve product quality, Improve service levels, Enable personalized products and services
	Increased capacity	Better visibility for whole purchasing process, Monitor performance of suppliers/customers effectively
	Improved Business Process	Streamline business, Improve coordination and integration of business process and departments
	Better position for e-Business	Increase overall competitiveness, Extend global market, Increase market share and margin
System-Quality	Data currency	Speed up information transmission flow
	Ease of use	Easy-to-use functionality
	Access	Reduce entry barriers
	Ease of learning	Reduce new employee ramp-up time
	Flexibility	Improve flexibility
	Efficiency	Improve responsiveness
	Sophistication	Support complex payment structures with ease
	Integration	Increase information sharing and exchanging
Information-Quality	Content accuracy	Improve Information quality
	Availability	Provide transparent data, Improve data availability
Inter-organizational integration		<p>Improve customer segmentation, Enable better customer attraction</p> <p>Enable long-term business relationship, Focus on customers and their needs, Enable integration with customers/suppliers, Allow multi-channel integration, Improve cross-selling/up-selling, Enable co-branding, joint-marketing and strategic alliances, Allow multi-channel communication, Improve overall supply chain performance, Improve channel choice, Speed up delivery lead-times, Enhance long-term profitability, Improve customer satisfaction, Increase sales, Improve customer loyalty, Improve pricing, Improve customer commitment, Improve collaborative planning, forecasting, and replenishment, Reduce the risk of product and transaction</p>

### The A-Priori Benefits Measurement Model

Having identified the dimensions, we now seek to identify the *measures* of the a-priori model. The authors of the IS-impact measurement model suggest that any further research in extending their work should employ the 37 ‘item pool’. During the mapping exercise, each of the 74 benefits was mapped into the most appropriate measure of the 37 item pool by the same two coders.

The design objectives of the a-priori benefits measurement model are similar to the ones addressed by the IS-impact measurement model. Given that CRM/SCM benefits measurement model too is conceived as a formative index, it

seeks qualities of: (1) model completeness - include all relevant dimensions and measures, where any ill-conceived additions or omissions good and bad, high and low, positive and negative may critically mask, neutralize or distort results, (2) model parsimony - where only the simplest and smallest relevant dimensions and measures are included, and (3) mutual exclusivity - where each measure addresses a unique benefit of CRM and SCM systems without having overlapping measures.

Figure 1 shows the a-priori CRM and SCM benefits measurement model, where the new dimension and the measures are shown in italic text. It is also evident that only 20 existing measures (54%) of the IS-impact model were populated by the citations, with 17 (46%) measures not instantiated with the citations. It is apparent that many of the measures of Information Quality and Individual Impacts were not instantiated by the citations, while all measures of organizational-impacts were instantiated. Moreover, a new measure titled “Profitability” was added to the organizational benefits dimension. It was rather surprising to note the exclusion of “Profitability” measure from the IS-impact measurement model, given this measure has been mentioned extensively in prior research (DeLone and McLean 2004; Griffith and Krampf 1998; Teo and Too 2000). The new dimension - “Inter-organizational integration” – has a synonymous dimension in DeLone and McLean (2004), where the focus was on assessing e-commerce success. The first four measures of the “Inter-organizational integration” were developed by mapping the citations of “Inter-organizational integration” in table 1 to the four measures of DeLone and McLean (2004). See table 2 for a sample mapping results. The last measure in Table 2 - “Improve trust between partners” – is a new measure that was not mentioned neither in DeLone and McLean (2004) nor in IS-impact model. However, “trust” is a common measure employed in Marketing research to measure the strength of a partner relationship (Keating et al. 2003; Wilson and Vlosky 1998). Therefore, we argue that it is rationale to include Trust as one measure in our a-priori model. Finally, as shown in Figure 1, the a-priori CRM and SCM benefits measurement model includes 25 measures, under 5 dimensions.

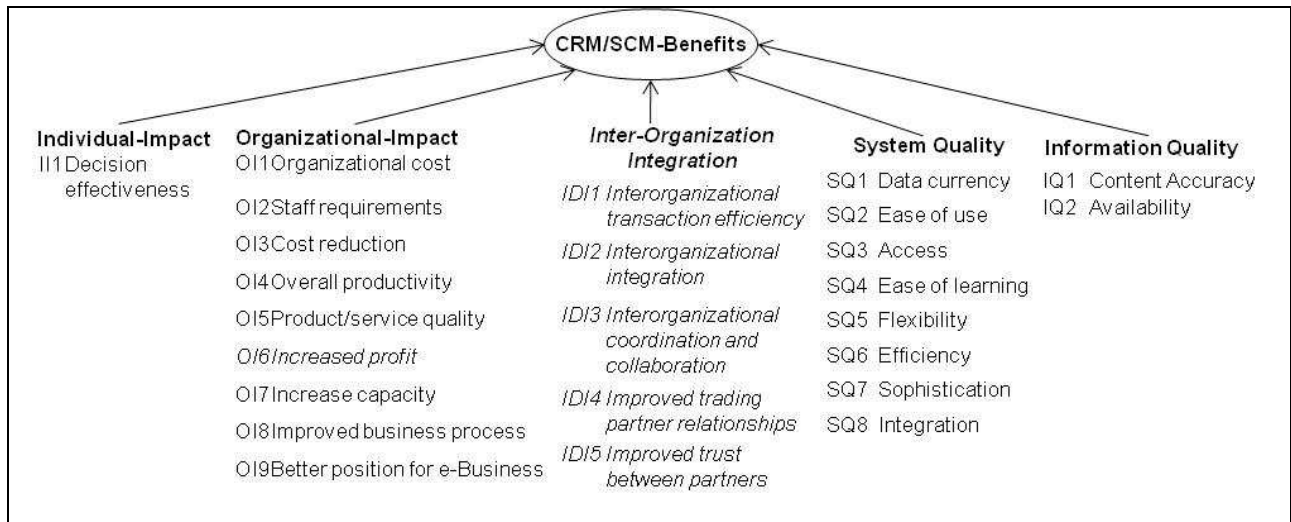


Figure 1: The a-priori model

Table 2. Mapped Example Measures into New Dimension Industry-Impact	
Inter-organizational transaction efficiency	Reduce outsource/order cycle time, Improve overall supply chain performance
Inter-organizational integration	Enable integration with customers/suppliers, Allow multi-channel integration
Inter-organizational coordination & collaboration	Focus on customers and their needs, Allow multi-channel communication, Improve cross-selling/up-selling, Enable co-branding, joint-marketing
Improved trading partner relationships	Enable long-term business relationship
Improved trust between partners	Improve customer satisfaction, Improve customer loyalty, Improve customer commitment, Reduce the risk of product and transaction



## Conclusion

This paper searches a list of benefits of CRM and SCM systems, and discusses the preliminary findings of a research attempting to develop a benefits measurement model for CRM and SCM systems. Considering that such benefits are multi-dimensional faceted, the goal is to derive a robust, validated measurement model for evaluating benefits that is simple yet generalizable. In a study design with two interrelated phases, this paper reports the findings of the exploratory first stage, where the intention was to understand the wealth of CRM/SCM benefits to derive a-priori model that can be tested in a subsequent quantitative survey. In gathering benefits of CRM and SCM systems, this study analysed 55 academic studies and 40 customer success stories arriving at 606 benefit statements. The content analysis and the synthesis removed the overlapping / repeating benefit statements, yielding 74 mutually exclusive benefits. Then by mapping the benefits items into IS-Impact model (Gable et al. 2008), we find a lot of benefits can not be covered in IS-Impact model, which demonstrates that a new benefits measurement model for CRM and SCM systems is necessary. Based on the mapping results, plus work of DeLone and McLean (2004) and other IS and Marketing researchers' findings, the authors consolidate an a-priori CRM and SCM benefits measurement model, employing 5 dimensions with 25 benefit measures. A series of focus groups are planned to further improve the measures of the a-priori model derived herein. The final benefits measures will then be tested using a quantitative survey. As mentioned by Shang and Seddon (2002), we acknowledge the limitation in using vendor-published successful stories as evidence, where the vendors may overstate the successes and benefits of their products and perhaps avoid their failures. However, given that the focus of the study is to develop a-priori benefits model that can be later empirically tested in focus groups and a large survey, usage of such success stories does not possess a great issue.

## Appendix A

Forty Web Cases			
AIS Public Company	Directv	Meiko Construction	Shure
Artaker CAD Systems	Eastman Chemical Company	North Tyneside Council	Siemens Power Generation
Australian Finance Group	Francotyp-Postalia AG	Oki Data Americas	Sociedade Michelin
Bank of Philippine Islands	Hanjin Shipping	Panasonic	Telefonica de Espana
Bartter Enterprises	Intersil Corporation	Port of San Diego	Thomas Cook AG
Borealis	Knorr-Bremse AG	Propex	Timex Corporation
Brown-Forman	Koch, Neff & Volckmar	Robert Bosch Lic	Toyota
Casas GEO	Lekkerland	RPM Solutions	Wilson tool International
Danisco A/S	LG Electronics	Sappi Fine Paper Europe	Xsigo Systems
Cherry	L'Oreal Brasil	Sealing Devices	YMCA of Metropolitan LA

Fifty-five Academic Studies		
Auramo et al. (2005a)	Jones et al. (2005b)	Rivers and Dart (1999)
Auramo et al. (2005b)	Kenneth (2007)	Roh et al. (2005)
Buttle (2004)	Ketikidis et al. (2008)	Sabri (2003)
Chalmeta (2006)	Kim et al. (2005)	Sahin and Robinson (2002)
Chen and Popovich (2003)	King and Burgess (2008)	Sheth and Sharma (2001)
Choy et al. (2003)	Leigh and Tanner (2004)	Sheth et al. (2000)
Craighead et al. (2006)	Liu et al. (2005)	Spekman and Carraway (2006)
Croteau and Li (2003)	McLaren (2004)	Subramani (2004)
Dehning et al. (2007)	McLaren et al. (2004)	Tanner et al. (2005)
Educators (2006)	Mikko et al. (2007)	Thomas et al. (2004a)
Eggert et al. (2006)	Padmanabhan et al. (2006)	Thomas et al. (2004b)
Elaine and Margaret (2006)	Park and Kim (2003)	Vakharia (2002)
Elizabeth et al. (2004)	Parvatiyar and Sheth (2001)	Verhoef (2003)
Frohlich (2002)	Peppard (2000)	Wilson et al. (2002)
Goutsos and Karacapilidis (2004)	Reinartz et al. (2004)	Winer (2001)
Gunasekaran and Ngai (2004)	Richards and Jones (2008)	Zahay (2004)
Hsu (2005)	Rigby and Ledingham (2004)	Zhang and Li (2006)
Jones et al. (2002)	Rigby et al. (2002)	Zikmund et al. (2003)
Jones et al. (2005a)		

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