2008年12月　第10卷　第4期
中　国　会　计　与　财　务　研　究
China Accounting and Finance Review
Volume 10, Number 4, December 2008

全面质量管理与企业业绩实证研究*

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摘要

一个有效的管理控制系统能帮助企业提高经营活动的效率和效果、减少管理失误、提高组织学习能力。虽然全面质量管理（TQM）作为一项重要的管理工具被引进我国已有多年，但关于TQM关键因素及其业绩后果的实证证据仍然非常缺乏。采用为TQM和业绩设计的综合量表，本文对TQM和企业业绩之间的关系进行了实证研究。本文不仅将全面质量管理作为一个整体，而且深入到全面质量管理的内部，辨识出全面质量管理的三大关键因素，并运用结构方程模型方法对TQM各关键因素之间及其与企业业绩的相互关系进行了全面检验。我们的研究发现，TQM水平与企业业绩之间有显著的正相关关系，而且TQM作为一个复杂的整合系统，各关键因素之间相互依赖、协调统一，共同促进企业各方面业绩的改善。本文关于TQM关键因素与企业业绩之间的直接与间接关系的研究，不仅丰富了质量管理和管理控制文献，还为实务界如何正确采用TQM战略提供了科学的指导。

关键词：全面质量管理、关键因素、业绩、结构方程模型

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* 本文系国家自然科学基金项目“管理会计控制系统与价值创造—全面质量管理实证研究”（项目批准号70671063）的阶段性成果，并得到上海财经大学“211工程”三期重点学科建设项目资助。本文作者衷心感谢两位匿名审稿人和执行编辑陈世敏教授提出的建设性修改意见，但文责自负。

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一、引言

一个有效的管理控制系统能帮助企业提高经营活动的效率和效果、减少管理失误、提高组织学习能力（Burns and Stalker, 1961; Lawrence and Lorsch, 1967）以及控制腐败行为（Perrow, 1986），从而增加企业价值。中国的经济改革—民营化和市场化—已从根本上改变了国有企业及其他企业的经济和监管环境，将我国企业推到了市场竞争的风口浪尖。这使企业开始更多地依赖先进的管理控制手段监控员工的业绩，诱使各职能经理将目标和精力转向组织合意的方面，从而提高企业业绩。其中一项非常重要的管理工具就是“全面质量管理”（total quality management，以下简称TQM）。

“二十一世纪是质量的世纪”，企业间最重要的竞争就是产品质量的竞争。随着全球产品竞争日趋激烈，全面质量管理在全世界范围内日益普及。Benson于1993年发表于《产业周刊》上的一篇文章指出：“过去10年中，TQM已像财务季报一样成为耳熟能详的商业思维方式”。我国从1978年开始推行全面质量管理，至今已近30年，总体效果不尽人意。Chow *et al.*（2007）和O’Connor *et al.*（2004）对西方先进管理会计技术在我国企业的运用状况进行的问卷调查中重点问及质量管理的内容。调查结果显示Kaizen（持续改进）方法、质量成本报告制度和全面质量控制在我国企业中得到了一定程度的应用，但其深度与广度仍有待提高。[3]随着市场经济体制的建立和对外开放程度的提高，尤其是在加入WTO以后，中国企业所面临的市场竞争强度和压力远胜于前。因此，如何在理论的指导下，积极探索企业运用TQM的成功之道，创造和保持核心竞争力，就成为摆在研究者面前一个重要的课题。

本文将考察我国企业的全面质量管理（TQM）关键因素与组织业绩之间的关系，本文的研究主要基于以下考虑：

首先，本文在国内首次探索性地通过严谨的实证研究验证全面质量管理与业绩之间关系。自上世纪六十年代以来，对于TQM这种“新”管理会计技术，西方学者不仅关注企业是否“应该”采用TQM技术的规范性问题，更为重要的是，他们对TQM在改善客户满意度、提供更好的产品和服务以及提升劳动生产率和利润等方面的贡献提供了众多的经验证据用来支持其立论。我国从1978年开始引进全面质量管理，在近30年时间里，国内学者纷纷撰文论述。但需要指出的是，国内文献的立论出发点无一例外地集中在企业“应该”采用什么样的管理技术或企业在采用上述技术时“应该”注意那些问题，鲜有文献能够提供我国企业采用上述技术的现状“是什么”以及“是否”有因素影响其效用的经

[3] 在Chow *et al.*（2007）的五分量表制下，我国企业在“Kaizen”和“质量成本报告制度”项上的平均得分各自为2.65和3.07，约53.27%和62.32%的企业在这两项上的得分达到3分或3分以上。在O’Connor *et al.*（2004）的七分量表制下，我国企业在“全面质量控制”项上的平均得分为4.54。

验证据。尤其是，我们尚没有关于企业采用TQM是否能够真正促进以及它如何促进企业业绩的严谨研究(Yusuf *et al.*, 2007)。本文的研究，是对我国质量管理和业绩关系的探索，这不仅丰富了质量管理文献，而且可以为我国企业提升管理层次提供参考。

其次，与以往研究不同，本文不仅探讨了TQM整体对业绩的促进作用，而且深入剖析TQM内部各关键因素对多种业绩的单独及共同影响。TQM是一种整合管理哲学，整合管理是质量管理过程的精髓（Ross, 1993）。TQM究竟包含哪些基本要素，它们之间相互作用的内在机理是什么，它们对企业最终财务业绩的影响又是通过何种传导机制得以实现的？厘清这些问题对于恰当执行TQM战略和设计TQM实务至关重要。然而，以前研究大多把TQM当作单一概念或以非常简单的方式度量TQM，如以是否获得质量大奖作为替代变量或仅从少数几个侧面直接向调查者询问其公司质量管理水平的高低。这样做有两点不足：一是计量不准确，没能反映TQM核心内容的全部特征（Hackman and Wageman, 1995），削弱了研究结论的可靠性；二是无法进一步研究TQM内部各关键因素之间的相互依赖性及对多种业绩的不同影响。本文从更广泛的角度对TQM和业绩变量进行了计量。以此为基础，我们对所提出的一个全面反映TQM关键实务及各种企业业绩之间相互关系的理论模型进行实证检验。本文的研究结果，将为实务界更好地进行TQM业务设计提供指导。

最后，我们运用结构方程模型方法来考察TQM各关键因素对于业绩的直接或间接影响。在实务中管理会计和其他组织特性往往是被同时选择的，这构成管理会计实证研究中一个棘手的问题（潘飞、文东华，2006）。以前多数研究往往先主观选择一个被认为是内生的变量（即因变量），然后将剩余的变量全看作是外生的变量（即自变量），这种武断的做法很容易导致解释变量与误差项之间的高度相关，假设检验结果不再可靠。所幸，管理会计研究运用带联立方程的结构方程模型方法能够大大减少这类联立方程偏差，从而更好地对数据与理论模型的符合程度进行评估。

本文其余部分的安排如下：第二部分先对TQM与企业业绩的关系进行理论阐述，然后提出研究假设；第三部分介绍研究方法和样本特征；第四部分报告实证检验结果；最后对全文进行总结。

二、理论背景与研究假设

1、文献回顾

TQM的倡导者们通过大量的论证表明TQM是一种能够给组织带来经济价值的资源。Juran（1988）指出，TQM可以通过理解和创造客户需求、改进客户满意程度、改进内部沟通、提高解决问题的能力、减少失误和浪费等途径为企

业创造价值。Wruck and Jensen（1994），Milgrom and Roberts（1990）认为TQM作为一种组织技术的创新，能够提高企业资本和劳动的生产力。资源基础理论（Resource-based theory）认为TQM能为企业带来持续竞争优势。尽管其它企业会想方设法模仿TQM成功企业的做法，但资源组合的异质性使模仿者不可能完全复制其竞争优势（Rumelt, 1984），竞争优势因而得以持续存在。

尽管TQM给企业带来的诸多益处得到广泛认可，但TQM仍存在重大的成本代价和执行障碍，如巨大的再培训成本、大量文书工作、大量时间的消耗甚至员工的抵触等（Powell, 1995）。因此，通过实证研究考察TQM对企业造成的净影响就显得意义重大。西方学者对TQM在客户满意度、产品与劳务质量、劳动生产率和利润等方面为企业带来的改进提供了大量证据。其中不少横截面的问卷研究为TQM的不同特征与察知效益（perceived benefits）之间的关系提供了佐证（参见Haim（1993）的一个概述）。另外一些研究利用公开财务数据考察了TQM与企业业绩之间的关系（如Hendricks and Singhal, 1996, 1997; Easton and Jarrell, 1998）。然而，对于TQM各因素对业绩的预测意义则存在较大分歧。Powell（1995）、Samson and Terziovsky（1999）声称“软性”（即支持性）TQM实务（如领导与承诺、员工授权、客户导向等）能带来质量改进。另一方面，Forza and Filippini（1998）指出，质量改进可通过“硬性”（核心）TQM实务实现，如过程控制和产品/服务设计等。

长期以来，质量管理都是管理会计研究的重要相关领域。Horngren *et al.*（2005）指出企业要高速地提供高质量的产品，必须识别和克服组织内部大量的约束条件，而管理会计能帮助管理者在不同的资源约束条件下作出包括质量管理在内的一系列正确决策（如关于质量成本的分析）。同时质量管理对于管理控制系统的形成和运作也具有重要的影响。Milgrom and Roberts（1990）指出，TQM等新的制造实务是新技术、战略与组织形式的综合体。这种复杂安排或实务常常引致企业业务处理方式的显著变化。

西方学者不仅从理论上论证了有效的管理控制系统能够提高经营活动的效果和效率，减少管理浪费和提高组织的学习能力，而且用实证研究证实了管理控制系统中组织结构与控制程序（Kalagnanam and Lindsay, 1999）、信息系统（Chenhall, 1997）和人力资源管理（Youndt *et al.*, 1996）对业绩的促进作用。而一些管理控制系统的创新业务如作业成本法和战略成本管理的业绩效应也在西方企业中得到了证实（Cagwin and Bouwman, 2002; Ittner *et al.*, 2003）。

反观我国，经济改革使得企业的经营环境和监管环境发生了根本性的变化。在激烈的市场竞争和不确定的环境下，管理控制系统开始在企业经营中扮演着越来越重要的作用（O'Connor *et al.*, 2004）。TQM更是早在二十世纪70年代经济改革伊始就被引进我国。然而直到目前，有关管理控制系统和TQM业绩后果的实证证据仍然非常缺乏（Zhao *et al.*, 2007）。随着我国企业产权制度改革的不断深入、市场化改革进程的逐渐提速、科学技术的迅猛发展和对外开放程度

的提高，我国企业在国内外市场上面临的竞争压力远胜于前，质量管理对于增强企业竞争优势的意义也更加重大。我们预计，与成熟经济体相类似，我国企业的TQM水平与业绩之间也会存在正相关关系。Yusuf *et al.*（2007）初步显示了这种正相关关系的存在，但我们对于TQM和业绩的计量更加广泛，而且量表的设计与TQM及其效益的理论描述更加一致。

2、研究假设

本文不仅研究TQM整体与业绩的产系，而且进一步探究TQM内部各关键因素之间的相互依赖性及其对于业绩的不同影响。质量管理文献始终强调质量管理是一种整合管理哲学，它要求企业强调客户导向、培养长期思维、倡导持续改进、鼓励员工参与、促进流程再设计、经常开展成果计量和与供应商加强联系等，而各个方面的“整合”是质量管理过程的关键。Mohoram *et al.*（1995）也指出：“绝大部分TQM实务都与某种形式的业绩改进相关联”。

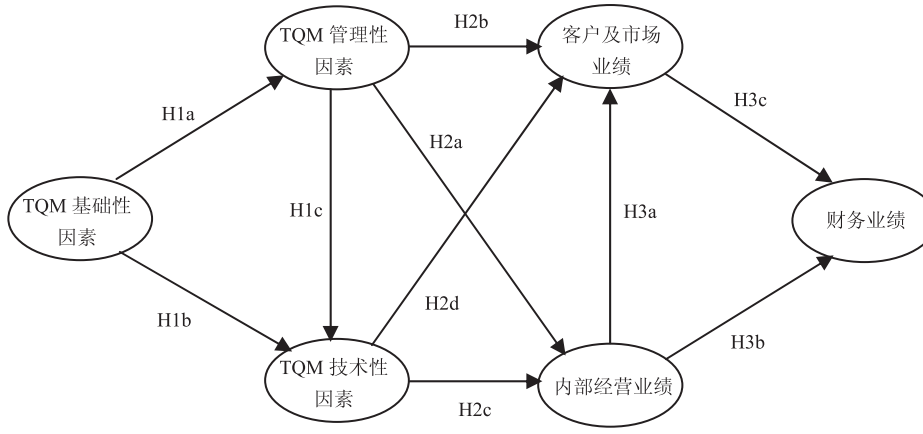
我们以质量管理领域五位重要学者Crosby、Deming、Feigenbaum、Ishikawa和Juran的著作为文献基础，总结出TQM的三项关键因素：基础性因素、管理性因素和技术性因素。基础性因素反映企业在营造质量管理环境上投入的资源和精力，涉及领导与承诺、雇员关系和教育培训等内容；技术性因素反映企业在价值链上的研、供、产、销等具体环节贯彻TQM哲学的程度，涉及供应商管理、产品和劳务设计和流程管理方面的内容；管理性因素反映企业在组织整个企业的日常质量管理工作时所出的一些制度性的安排，涉及质量数据报告和专门质量管理部门作用方面的内容。我们认为TQM三项关键因素之间存在相互影响和相互促进的作用。

对于业绩的衡量，质量管理文献并不一致。一些研究仅考察了内部经营层次的业绩（如Samson and Terziovsky, 1999），另一些研究只考察了财务业绩（如Douglas and Judge, 2001），还有一些研究考察了不同层次的业绩指标，如Kaynak（2003）。Kaplan（1983）指出，在现代生产环境下，要全面及时地衡量企业的整体业绩，单纯用财务业绩是不够的，需要将非财务指标作为必要的补充。因此，依据质量管理和经营管理方面的文献，我们确认了与质量管理相关的三个方面的业绩：内部经营业绩、客户及市场业绩和财务业绩。

基于上述分析，我们提出本文的总体假设：TQM是一个复杂的综合系统，各关键因素之间相互依赖、协调统一，共同促进企业各方面业绩的改善。为细化总体假设，我们在借鉴组织变革和经营管理、质量管理文献的基础上，为TQM关键因素与企业业绩之间的相互关系提出一系列具体的子假设，形成我们的理论模型（如图1）。该模型中的每条路径分别代表一项子假设。以下我们对每项子假设分别进行阐述：

Deming、Juran等质量管理专家提出，基础性实务为TQM的有效运行提供了良好的环境，是TQM执行过程中至关重要的因素。它不仅是对管理性实务中各

图1 TQM各关键因素和业绩关系的理论模型



种行为规范和制度的直接背书，也为技术性实务提供了精神动力和资源保障，因而它同时通过管理性实务和技术性实务从而对业绩产生影响。比如，TQM的有效执行要求企业的组织文化进行重大变革，但如果企业领导不致力于持续改进、开放式交流和整个价值链相互合作的目标，这种变革将不可能实现。最高管理层对TQM的领导不仅可以为培训员工掌握新原则和工具提供必需资源，为员工积极参与变革创造良好的工作氛围，而且可树立专门质量管理部门在企业中的重要地位，为质量数据报告的内容、格式及报送方式提供方向性的建议，还可以积极确立采购策略及与价值链上端企业的相互关系，促使和保证企业致力于满足客户和市场需求的产品劳务设计。员工培训是能引起组织重要变革的手段之一。欲使企业对质量长抓不懈，必须不断加强工人在技术和质量方面的培训。培训是雇员恰当理解和提供高水平的质量数据报告的必要条件。我们可以合理预计，培训数量与质量的增加，将会显著提高雇员的相关质量意识和技能，从而在研、产、供、销的各个环节“一次就将工作做好”。良好的员工关系能够提升员工参与程度、雇员认同感、团队工作以及组织目标的有效沟通等，使得雇员在质量数据收集和使用中，以及在价值链上的各类核心作业中都能充分调动团队的力量和智慧，真正做到全过程管理和全员参与。因此我们提出假设H1a和H1b：

H1a：TQM基础性因素对管理性因素具有正面影响作用。

H1b：TQM基础性因素对技术性因素具有正面影响作用。

TQM管理性实务指专门质量管理和质量数据报告等日常性质量管理工作的制度性安排，它使技术性实务能够按照一定的垺范和制度有条不紊地进行。专门质量管理部门是连接企业研、供、产、销等各部门质量工作的纽带，它不仅

对各部门的质量管理工作进行领导和监督，而且对这些部门提供专业建议和技术支持，更重要的是，对于一些重大的质量问题，专门质量管理部门可以很方便地牵头成立专门的跨部门工作团队进行专门攻关，从而大大提高各部门质量管理工作的效率。设计科学的质量数据和报告可使信息能够在企业上下级之间、各个部门和岗位之间顺利地沟通，不仅为企业领导提供了决策依据，而且为研、供、产、销各部门员工提供了重要反馈信息和奋斗的标杆，从而激励他们对业务做出持续改进，为企业创造和保持竞争优势。因此我们提出假设H1c：

H1c：TQM管理性因素对技术性因素具有正面影响作用。

著名管理学家Kaplan（1989）指出，“评估什么,就得到什么结果”。Ittner and Larcker（1995）认为，TQM只有辅以区别于传统方法的新型信息与评价系统，其效应才能得到充分体现。具体而言，TQM要求提供更加及时和详尽的内部经营信息以及质量和客户满意度信息，而不仅仅是财务数据。即，在内部经营方面，除了向工人提供“自上而下”的信息（如标杆信息、预算标准和差异等），TQM的问题解决型工作方法还要求工人自己收集和提供“自下而上”的流程信息（如统计过程控制，帕累托分析法和流程图法获得的信息），并为员工的学习提供快速的反馈信息；在客户管理方面，通过将报酬与质量和客户满意度相关指标挂钩，企业可以培育对客户的管理承诺，将满足客户的需要而改进质量的重要意义传达给所有员工，并确保质量的改进和客户满意度成果被视为与财务成果同等重要。一般而言，在一个高效的质量管理部门监督和协调下所形成的良好的质量数据报告能够充分反映TQM对信息的上述要求，因而能够促进企业内部经营业绩以及客户与质量业绩的改善。由此，我们提出假设H2a和H2b：

H2a：TQM管理性因素对内部经营业绩具有正面影响作用。
H2b：TQM管理性因素对客户及市场业绩具有正面影响作用。

企业在研、供、产、销等一线部门的质量管理直接决定了生产经营绩效。具体而言，在供应商方面，有效的供应商管理可以鼓励其对产品设计和质量的投入，与供应商之间良好的关系可以促使供应商积极考虑购买者的产品、劳务设计，对双方共同简化产品设计提供良好建议，还可以帮助企业高效地从供应商获取原材料和零部件。原材料和零部件的变动是造成过程变动的主要原因，加强对供应商的管理，可以帮助削减和消除原材料和零部件变动对过程管理带来的负面影响，也有利于对机器和工人进行内部控制。供应商有效管理的一个直接贡献是企业存货水平下降（Easton and Jarrel, 1998; United States General Accounting Office, 1991），这可使企业持续地减少废品、削减安全存货、缩短订货提前期和生产周期。Chapman and Carter（1990）的研究显示，成功的客户/供应商管理可为双方带来存货降低的利益。在产品/劳务设计方面，TQM要求“将

质量嵌入产品设计中”（Flynn *et al.*, 1995），产品设计一方面要降低每件产品所需零部件的数量，另一方面要求使零部件的规格标准化（Chase *et al.*, 2001），这样就能降低流程复杂性和减少流程变动，有利于更有效地进行流程管理。减少单位产品所需零部件数量，将零部件规格标准化可以大大促进雇员的学习效应，提高产品质量和降低成本，另外通过将客户质量要求嵌入产品设计，使得企业能生产出更多满足客户要求的高质量产品，不断扩大市场，获得持续竞争优势。在流程管理方面，TQM意味着傻瓜式流程设计、稳定的任务分配和稳定的工作日程表，这将减少流程变动。在稳定的生产过程中质量问题能被及时发现和纠正，从而降低废品和返工产品的数量。生产质量的提高可带来最终产品质量的提高，再加上较低的生产成本和较短的生产周期，企业能够不断扩大竞争优势。

因此我们提出假设H2c和H2d：

H2c：TQM技术性因素对内部经营业绩具有正面影响作用。

H2d：TQM技术性因素对客户及市场业绩具有正面影响作用。

企业内部经营业绩的改善如废品率降低、产品生产周期和送货周期的缩短等能帮助提高产品质量、客户满意度和扩大市场份额，从而改善客户及市场业绩。内部经营业绩的改善能大大降低总体质量成本中的内外部损失成本，从而直接改善财务业绩，也能够通过客户及市场业绩改善来间接提高财务业绩。因此，我们提出假设H3a、H3b和H3c：

H3a：内部经营业绩对客户及市场业绩具有正面影响作用。

H3b：内部经营业绩对财务业绩具有正面影响作用。

H3c：客户及市场业绩对财务业绩具有正面影响作用。

三、样本和研究方法

1、问卷设计及发放

本研究所使用的全部数据均来自于TQM与企业业绩的问卷调查。该调查是一项更广泛的中国企业MCS研究项目的一部分。在编制和修改调查问卷过程中，我们采取了以下必要步骤保证调查问卷的质量。

首先，我们在回顾质量管理、管理会计和组织学相关文献后按照前述理论框架设计最初的问卷。

接着，我们请管理会计与质量管理领域的专家对问卷的内容进行审阅，并根据其意见进行了相应的修改。

继而，我们请三位博士生同学和二位企业管理人员试填问卷，并请他们就内容的全面性、准确性、熟悉程度，设问方式，遣词用句，问卷篇幅，适合填

写人员类型、回答所需时间等给出反馈意见。根据这些意见和问卷回答情况，我们对问卷作再一次修改，除了完善内容，还尽量使用实务界人士日常接触的词汇，并将问卷长度从16页压缩至9页，以便于答卷者能在半个小时之内完成问卷。

2005年7月下旬至8月上旬，我们对选定的四家企业进行实地访谈，同时进行了初步的测试（Pilot Test），这四家企业分别属于汽车制造业、电子制造业、建筑业和水供应业，其中两家是外商投资企业，一家国有企业，一家民营企业。我们与企业的总经理、财务总监、总工程师及中层财务人员就修改后的问卷和预先准备的18个开放式问题进行了一对一形式的深入访谈，访谈使我们对企业实际的质量管理与管理会计控制状况有了更具体的了解，并初步印证了原先设想的正确性。访谈结束后，我们将问卷留在企业里，请他们完成后寄给我们。然后我们根据问卷回答情况和访谈中得到的信息对整个问卷进行了相应的调整。

为提高问卷的应答率，我们借助上海财经大学和上海国家会计学院的教学资源，主要向MBA、EMBA、MPACC和国有企业总会计师（财务总监）培训班中的学员发放问卷，此外，现已在企业中担任重要领导岗位的本文作者以前的同学和学生也是问卷发放的潜在对象。我们从备选企业清单中选出规模较大、主营业务突出且质量管理和管理会计控制均具一定水平的制造型和服务型企业，为每个企业指定一个联系人，以邮递或E-mail方式将问卷发放至联系人，请其物色了解企业质量管理、内部控制和财务业绩的中高层管理者填写，倘若一人不能独立完成，则建议由几人共同填写。

最后。在等待问卷返回的时间里，我们还以电话或E-mail敦促联系人，请其尽力帮助在保证回答质量的基础上按时完成问卷。

2、变量计量

（1）TQM

在质量管理实证文献中，不少学者试图构建一个量表（instrument）恰当度量TQM采用的程度，如Saraph *et al.*（1989）、Flynn *et al.*（1994）、Ahire *et al.*（1996）、Black and Porter (1996)，除此之外，由美国商务部倡导的美国鲍里奇质量奖评奖标准也体现了TQM内涵。本文所使用的TQM量表是以Saraph *et al.*（1989）和鲍里奇奖评奖标准为蓝本，并借鉴其他学者的研究成果以及考虑中国具体国情而制定的。整个TQM量表包括基础性因素、技术性因素和管理性因素，分别反映了领导与承诺、员工关系、教育与培训、供应商管理、产品和劳务设计、流程管理、质量数据报告和专门质量管理部门作用等方面的内容。我们设计的TQM量表共包含34个题目，附录列示了主要内容。

（2）企业业绩

关于企业业绩的定义与计量是一件很复杂的事情。根据研究目的的不同，研究者对业绩这一概念的处理方式也不一致，多数研究要么只考虑了经营业绩，要么只考虑了财务业绩，只有极少数研究同时考虑了多种业绩（Kaynak, 2003）。为了全面反映TQM与业绩之间的关系，本文按照Kaplan and Norton（1992）提出的平衡计分卡思想，采用多元化业绩的概念，将业绩划分为三大类：内部经营业绩、客户及市场业绩和财务业绩。在此基础上，借鉴Kaynak（2003）的研究成果，我们设计出包含15个题目的企业业绩量表，分别反映了上述三种业绩的内容。其中内部经营业绩包括产品缺陷率、损失成本与销售收入的比率、产品生产周期和送货提前期等；客户及市场业绩包括产品或劳务可靠性、综合劳动生产率和客户满意度等；财务业绩包括营业利润率、总资产收益率等指标。附录中列示了关于企业业绩的具体问题。

3、样本描述

整个问卷调查过程自2005年8月开始至2006年3月结束，前后历时8个月，共发出498份问卷，回收243份，有效问卷为237份，问卷实际回收率为47.59%，其中上市公司29家，占12.24%，问卷回收总数和实际回收率都达到了研究要求（参看Van der Stede *et al.*, 2005）。研究样本的总体特征概述如下：

从所处行业看，被调查的公司分布广泛，涉及中国证监会所列的全部22个行业。在237家企业中，所占比例在10%以上的行业均为制造业，其中机械、设备、仪表占14.3%、电子占13.9%，纺织、服装、皮毛占11.4%。样本公司中既有劳动密集型行业，也有资金密集型和技术密集型行业。行业分布的广泛性，确保了我们的研究结论有较大的推广价值。

样本公司绝大部分是大中型企业。样本公司员工人数低于100人的小型企业仅占13.4%，员工人数为100–499人的占29.4%，500–1999人占31.6%，2000–9999人占19.5%，10000以上占6.1%（如表1，Panel A）。样本公司销售收入及总资产的分布情形与员工人数非常相似。

问卷填写人中大多数为中高层管理者，其所占比例为72.9%，其中：高层管理者占25.9%，中层管理者占57.5%，基层管理者占15.4%（如表1，Panel B）。

有221位被调查者披露了在公司服务年限信息，服务年限最长的为25年，最短为1年。有78.7%的被调查者已在公司服务3年以上，近一半（44.2%）的被调查者服务6年以上，10年以上的占25.3%，这表明被调查者拥有较丰富的工作经验，对企业的情况比较熟悉，其回答准确性较高（如表1，Panel C）。

4、结构方程模型

我们用结构方程模型（SEM）来检验所提出的假设。与传统线性回归技术只能检验具体（或直接观测的）指标变量之间关系不同，结构方程模型可用于

表1 样本企业和应答者特征

	数量	比例（%）
Panel A：员工人数		
0–99	31	13.4
100–499	68	29.4
500–1999	73	31.6
2000–9999	45	19.5
10000 或以上	14	6.1
小计	231	100.0
缺失值	6	
合计	237	
Panel B：应答者职位		
高层管理者	59	25.9
中层管理者	131	57.5
基层管理者	35	15.4
其他	3	1.3
小计	228	100.0
缺失值	9	
合计	237	
Panel C：应答者已服务年限		
1–2年	47	21.3
3–5 年	74	33.5
6–9 年	44	19.9
10年以上	56	25.3
小计	221	100.0
缺失值	16	
合计	237	

检验潜在的（不可直接观测）理论变量之间的相互联系。结构方程的主要优点是它容许存在测量误差，可同时处理多个因变量，同时估计因子结构和因子关系并能对模型整体提供诊断信息（Jöreskog and Sörbom, 1979）。对于检验本文所提出的假设，结构方程模型是一种更加有效的方法。本文的结构方程模型由六个潜变量组成，它们分别是TQM基础性因素、TQM管理性因素、TQM技术性因素、内部经营业绩、客户及市场业绩和财务业绩。由于每个潜变量分别由问卷中的多道题目来测量，因此我们的分析分两个阶段进行：首先我们对测量模型进行检验，包括估计潜变量与指标变量（题目）之间的路径参数，然后在让

测量模型保持不变的情况下，我们对结构方程中的各条路径进行假设检验。本文对结构方程模型的所有估计均通过AMOS 5.0软件完成。

四、实证结果

1、测量模型的整体拟合度分析

在评价全体结构方程模型之前，我们须采用验证性因子分析（CFA）对测量模型的有效性进行评估（Byrne, 1998; Jöreskog and Sörbom, 1993）。在测量模型中，问卷中的49道题目均被事先设定为只表征一个潜变量的指标变量（见附录）。由于验证性因子分析可以根据理论分析事先指定哪个指标变量负载于哪个因子（潜变量），因而总体来说，其分析结果比探索性因子分析更加准确（Long, 1983; Segars and Grover, 1993; O'Leary-Kelly and Vokurka, 1998）。[4]我们选择了最大似然估计法对测量模型和结构模型进行估计，它的一个主要优点是即使数据偏离了正态分布，也能提供良好的参数估计（Chou and Bentler, 1995）。

要检视模型是否与数据拟合，需要比较再生协方差矩阵和样本协方差矩阵的差异。这两个矩阵的整体差异，可用一个综合数字（即拟合指数）表示，χ^2是其中最基本的一个。在一定的条件下，常用的估计方法得到的χ^2渐近服从于卡方分布，χ^2越大，再生协方差矩阵和样本协方差矩阵的差异越大。给定显著性水平，若χ^2值大于对应的临界值，认为模型与数据拟合不好。反之，若χ^2小于临界值，则认为模型与数据拟合得好。然而，直接应用χ^2检验推断一个模型是否与数据拟合并不妥当。问题在于χ^2的大小与样本容量N有关，当N很小时，χ^2往往很小，使得与真实模型相距很远的的错误模型，也给人拟合得好的印象。而当N很大时，χ^2则很大，一个模型只要与真实模型有很小的差距，就可能被认为拟合不好（侯杰泰等，2004）。为解决上述问题，文献上先后出现了四十多种拟合优度指数用于评价和选择模型，其中大部分指数都以χ^2为基础，只是加上各式各样的修正。

在评价测量模型与数据是否拟合时，我们主要观察参数的标准误、T值、标准化残差、修正指数和一系列拟合优度统计量（Jöreskog and Sörbom, 1993）。在衡量测量模型与数据拟合程度的众多指标中，我们选用了卡方自由度比（χ^2 / *df*），近似误差均方根（RMSEA）、Akaike一致信息指数（CAIC）、省俭拟合优度指数（PGFI）、省俭赋范拟合指数（PNFI）、和相对拟合指数（CFI）。

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[4] 由于探索性因子分析允许各道题目在不只一个因子上有负载，因而它并没有对构念的单一构面性进行明确的测试（Segars and Grover, 1993）。相反，验证性因子分析严格体现了单一构面性原则（O'Leary-Kelly and Vokurka, 1998）, 因而在量表可接受性的问题上会得出不一样的结论。

这些指数是评价模型拟合优度时最常用到的指数，且对三大类指数—绝对拟合指数、相对拟合指数和简约拟合指数—均有所体现。当中除了RMSEA以外，其他指数都能随模型复杂程度和自由度做出适当调整，而RMSEA虽然对模型复杂程度比较敏感，却是衡量绝对拟合程度最有信息含量的标准之一（Byrne, 1998）。

在对测量模型进行评估的过程中，我们通过对修正指数和标准化残差的观察发现了量表中一些冗余的题目。根据Byrne（1998）的建议，我们删除了这些题目，使得模型与数据拟合得更好。从表2中的Panel A可以看出，TQM测量模型中除RMSEA值略微超过可接受程度外，其它拟合指数值均在可按受范围内，表明TQM测量模型和业绩测量模型与数据的拟合令人满意。表2中的Panel B列示了通过验证性因子分析后保留下来的题目及其在相应因子上的负载。

从表3中的Panel A可以看出，业绩测量模型的所有拟合指数值均在可按受范围内，表明业绩测量模型与数据的拟合令人满意。表3中的Panel B列示了业绩的验证性因子分析结果。

表4列示了各潜变量的均值、标准差、简单相关系数和Cronbach α值。从表中可以看出，潜变量间的两两相关系数均显著为正，表明当单独分析时，数据为各项子假设提供了初步支持。为获得结论性的证据，我们还需要将全部变量放置在一个结构方程模型中以对各子假设进行综合评价。

表2 TQM验证性因子分析（N = 237）

Panel A：测量模型评估

拟合优度统计量	TQM测量模型	可接受值
卡方自由度比	707.71/272 = 2.602	<3.0[a]
RMSEA	0.082	<0.08[b]
CAIC	1124.899	小于饱和模型和独立模型[c]
饱和模型的CAIC	2270.289	
独立模型的CAIC	5472.127	
PGFI	0.671	>0.5[d]
PNFI	0.783	>0.5[d]
CFI	0.911	>0.9[b]

[a] Bollen (1989), Carmines and Mclver (1981), Hair *et al.* (1995).

[b] Byrne (1998), Jaccard and Wan (1996), Jöreskog and Sörbom (1993).

[c] Byrne (1998), Jaccard and Wan (1996), Jöreskog and Sörbom (1993).

[d] Byrne (1998), Mulaik *et al.* (1989).

表2 续

Panel B：因子分析结果

项目名称	项目内容	因子载荷
	TQM基础性因素	
Q1	高管质量业绩的地位	0.647
Q3	推动质量战略和体系的积极性	0.779
Q4	质量目标和职责的清晰度	0.821
Q5	质量目标和政策的理解度	0.779
Q6	鼓励质量团队的力度	0.827
Q7	个人质量责任	0.766
Q8	员工质量意识和知识	0.872
Q9	质量奖励	0.816
Q10	思想和观念普及	0.873
Q11	生产工人培训	0.796
Q13	培训资源	0.732
	TQM管理性因素	
Q28	质量数据详细准确程度	0.733
Q31	统计方法在质量控制中的应用	0.701
Q32	独立性与沟通能力	0.846
Q33	专业指导	0.942
Q34	参与和协调	0.930
	TQM技术性因素	
Q14	供应商质量优先原则	0.604
Q17	供应商流程合作	0.760
Q18	客户要求在设计中的体现	0.703
Q20	设计中各部门的协调	0.806
Q21	对标准和程序的明确规定	0.774
Q23	自动化管理	0.690
Q24	阶段性栓查	0.801
Q25	计划或任务均衡性	0.790
Q27	岗位指南	0.767

表3 企业业绩验证性因子分析（N＝237）

Panel A：测量模型评估		
拟合优度统计量	业绩测量模型	可接受值
卡方自由度比	103.24/41＝2.518	<3.0
RMSEA	0.080	<0.08
CAIC	264.938	小于饱和模型和独立模型
饱和模型的CAIC	426.892	
独立模型的CAIC	1749.034	
PGFI	0.575	>0.5
PNFI	0.700	>0.5
CFI	0.962	>0.9
Panel B：因子分析结果		
项目名称	项目内容	因子载荷
	内部经营业绩	
Q37	产品缺陷率	0.867
Q38	内部损失成本比率（比率越低得分越高）	0.901
Q39	外部损失成本比率（比率越低得分越高）	0.876
Q40	生产周期和送货提前期	0.703
	客户及市场业绩	
Q36	综合劳动生产率	0.663
Q42	创新产品	0.606
Q43	竞争地位	0.820
Q44	市场占有率	0.727
	财务业绩	
Q46	营业利润增长率	0.855
Q48	营业利润率	0.925
Q49	税前总资产收益率	0.868

2、信度与效度检验

评估测量模型除了看总体拟合度，还需要分析各个构念的信度与效度。对信度的评价主要看Cronbach α值。从表4可以看出，TQM基础性实务、管理性实务和技术性实务三个因子的Cronbach α值分别为0.949、0.914和0.917，企业业绩的内部经营业绩、客户及市场业绩和财务业绩的Cronbach α值分别为0.902、0.784和0.912，所有因子的Cronbach α值均超过了可接受水平0.7（Nunnally and Bernstein, 1994），表明各因子的信度很高。

表4　变量描术性统计、相关系数及Cronbach α表 (N = 237)

Variable	1	2	3	4	5	6	均值	标准差	Cronbach α
1. TQM基础性因素	1.000						6.150	1.538	0.949
2. TQM管理性因素	0.749***	1.000					5.996	1.604	0.914
3. TQM技术性因素	0.843***	0.820***	1.000				6.180	1.417	0.917
4. 内部经营业绩	0.405***	0.433***	0.421***	1.000			6.175	1.387	0.902
5. 客户及市场业绩	0.456***	0.448***	0.492***	0.633***	1.000		5.969	1.192	0.784
6. 财务业绩	0.249***	0.188***	0.254***	0.302***	0.617***	1.000	5.676	1.417	0.912

注：*、**、***分别表示在0.10、0.05、0.01水平上双尾栓验显著。

问卷的效度主要从单一构面性（uni-dimensionality）、聚合效度（convergent validity）和区别效度（discriminant validity）三个方面进行考量。单一构面性指各项目只由唯一潜变量表示的程度。单一构面性即可用探索性因子分析也可用验证性因子分析加以检验，Anderson and Gerbing（1988）指出，验证性因子分析能比探索性因子分析更好地评价单一构面性。关于验证性因子分析的内容在评价测量模型总体拟合度时已经述及，以下只分析聚合效度和区别效度。

聚合效度指某一量表所测结果与对同一特征的其他测量之间相互关联的程度。在计量研究中，因子的每一个项目都可看作对某一构念的不同测量方法（Ahire *et al.*, 1996），我们可用每个项目与相关因子的回归系数的T检验来评估聚合效度，如果每个项目的系数估计值与其标准误差之比（T值）大于2，则表明有较高的聚合效度（Krause, 1999）。本研究中TQM和企业业绩最终保留项目与对应潜变量路径系数的T值均远远大于2，聚合效度令人满意。

区别效度是指量表所测结果与对其他不同特征的测量不相关联的程度。如果每个因子与其他因子的相关系数均低于其Cronbach α值，则认为有较好的区别效度。从表4可以看出，尽管各因子间的相关系数较高，但都小于相应的Cronbach α值，表明量表有较满意的区别效度。

3、结构方程模型结果

为对各项子假设进行检验，在确定测量模型后，我们遵循Anderson and Gerbine（1988）的建议，从理论模型出发，通过评估一系列嵌套模型来确定最终的修正模型。其核心思想是：如果一个嵌套模型在拟合优度方面（比如χ^2）与原模型差别不大，那么从建模的节俭性原则出发，我们就认为嵌套模型比原模型更可取。具体做法是：先将理论模型作为原模型进行初步拟合，从众多路径中选择估计参数最不显著的那条路径加以删除（将其路径参数设定为0），从而得到原模型的一个嵌套模型，然后看嵌套模型相对于原模型的χ^2增加值在统计上是否显著，如果差异显著，表明对原模型的修正不合适，应该将原模型确定为最终模型。如果差异不显著，则表明对原模型的修正是合宜的，我们以该嵌套模型为新的原模型，重复进行上述测试工作，直至嵌套模型相对于原模型的χ^2增加值在统计上变得显著。依此方法，我们在删除TQM管理性因素至客户与市场业绩、内部经营业绩至财务业绩两条路径后，得到了最终的修正模型。

对于结构模型拟合优度的评价我们选用了与测量模型相同的指标。从表5中的Panel A可以看出，结构模型中所有拟合指数值均在可接受的范围内，表明我们的结构方程模型与数据有很好的拟合。表5中的Panel B是我们按上述方法得到的关于TQM实务与各种业绩之间关系的最终修正模型的结果。图中的各条实线路径代表了各个相应的子假设。相关路径参数和T检验值列于其旁，虚线则表明已从理论模型中删除的路径。从表中可以看出，除了H2b和H3b以外，其余八项子假设均通过了显著性检验，各路径系数的符号也符合预期。管理性实务对客

户及市场业绩的促进作用（假设H2b）没有得到证实的可能原因是质量管理部门的主要功能是对经营过程进行控制，而不是直接对客户要求做出反应。内部经营业绩与财务业绩之间的正相关关系（假设H3b）没有得到证实的可能原因是企业内部经营业绩改善虽然降低了内外损失成本，但却增加了预防和检验成本，因而整体质量成本没有得到降低。这表明在TQM通过增加收入和降低成本提升业绩的两条途径中，只有前者得到有效利用，后者尚有提升空间。

表6列出了TQM和业绩变量间的直接效应、间接效应和总效应。

总结表5中的Panel B和表6，我们得到如下结论：

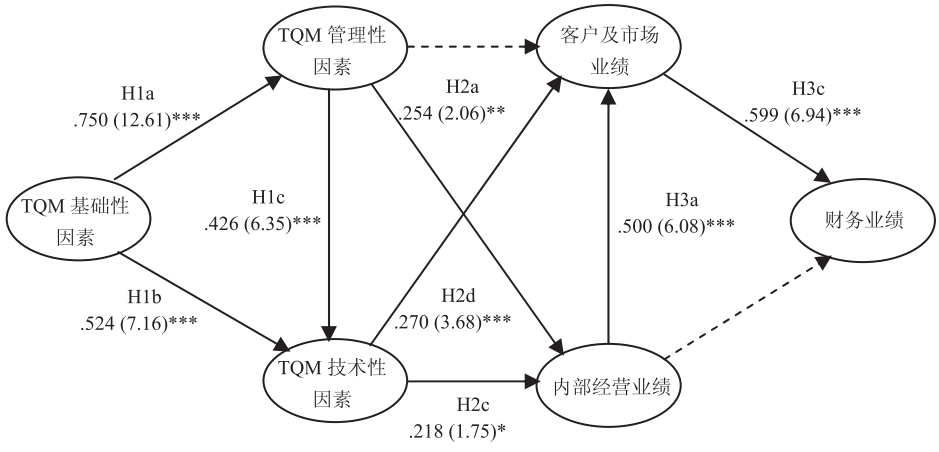
1、TQM各关键因素之间有着密切的联系，其中基础性实务对于TQM的有效运行至关重要，它不仅直接正向影响技术性实务的执行水平，而且通过管理

表5 TQM各关键因素和业绩关系的结构方程模型结果

Panel A：结构模型评估

拟合优度统计量	结构模型	可接受值
卡方自由度比	1200.99/586 = 2.049	<3.0
RMSEA	0.067	<0.08
CAIC	1718.438	小于饱和模型和独立模型
饱和模型的CAIC	4307.728	
独立模型的CAIC	7556.625	
PGFI	0.687	>0.5
PNFI	0.778	>0.5
CFI	0.908	>0.9

Panel B：结构模型结果



1、各条路径旁依次列出了标准化路径系数及其T值（在括号内）。

2、*、**、***分别表示在0.10、0.05、0.01水平上双尾栓验显著。

表6 TQM与业绩变量的直接效应和间接效应（N＝237）

因变量	自变量	直接效应	间接效应	总效应
TQM管理性因素	TQM基础性因素	0.750		0.750
TQM技术性因素	TQM基础性因素	0.524	0.320	0.844
	TQM管理性因素	0.426		0.426
内部经营业绩	TQM基础性因素		0.374	0.374
	TQM管理性因素	0.254	0.093	0.347
	TQM技术性因素	0.218		0.218
客户及市场业绩	TQM基础性因素		0.415	0.415
	TQM管理性因素		0.288	0.288
	TQM技术性因素	0.270	0.109	0.379
	内部经营业绩	0.500		0.500
财务业绩	TQM基础性因素		0.249	0.249
	TQM管理性因素		0.173	0.173
	TQM技术性因素		0.227	0.227
	内部经营业绩		0.300	0.300
	客户及市场业绩	0.599		0.599

性实务间接对技术性实务产生正向影响，技术性实务的水平受到基础性实务和管理性实务的双重影响。

2、TQM各关键因素对财务业绩没有直接影响，它们通过改善内部经营业绩、客户及市场业绩来间接提升财务业绩。其中，技术性实务对内部经营业绩和客户及市场业绩均有直接正向影响；管理性实务只对内部经营业绩有直接正向影响，但通过技术性实务对内部经营业绩和客户及市场业绩产生间接正向影响；基础性实务不对任何业绩产生直接影响，但通过管理性实务和技术性实务对各类业绩产生间接影响。

3、企业各种业绩之间有着明显的传递作用。客户及市场业绩的改善能通过收入的增加直接提升财务业绩，内部经营业绩可以通过对客户及市场业绩的影响而间接正向影响财务业绩，但由于内部经营过程的改善总体上没有起到降低成本的作用，因而未能对财务业绩有直接贡献。

4、总体来看，我国的TQM实务对提升业绩做出了显著贡献。

五、结语

利用为TQM和业绩设计的综合量表，本文证实了TQM和企业业绩之间存在显著的正相关关系。TQM被引进我国已有多年，但关于TQM关键因素及其业

绩后果的实证证据仍然非常缺乏。虽然Yusuf *et al*. (2007) 运用问卷为TQM在我国的广泛采用和对业绩的贡献提供了初步证据，但我们对于TQM和业绩的计量更加广泛，量表的设计与TQM及其效益的理论描述更加一致，因此结论更加稳健。更重要的是，我们运用验证性因子分析方法确认了TQM的三大关键因素，并对TQM各关键因素之间及其与企业业绩的相互关系进行了全面检验。我们的研究发现，TQM作为一个复杂的整合系统，各关键因素之间相互依赖、协调统一，共同促进企业多方面业绩的改善。

我们的研究为我国企业TQM的业绩效应及内在运作机理提供了重要的实证支持，这不仅丰富了质量管理和管理控制文献，而且对于已经采用和准备采用TQM的企业是一个很好的激励。更重要的是，我们的研究为实务界如何正确采用TQM战略提供了科学的指导。我们的研究表明，TQM基础性实务、管理性实务和技术性实务联系密切，卓越业绩的获得是企业各个层次人员齐心协力进行全过程质量管理的结果。企业应当抓住TQM各关键因素之间及其与各种业绩之间的内在联系，对TQM实务进行恰当设计，并在执行TQM战略过程中进行有效的协同与控制，只有这样才能最大限度地发挥TQM的作用。

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附录：全面质量管理与企业业绩调查问卷的主要内容

第一部分 全面质量管理

请根据具体情况客观判断您所在企业的特征与下列陈述吻合的程度。答案分为九个等级：1＝完全不吻合，5＝基本吻合，9＝完全吻合。

一、基础性因素

1、在对高层管理者的业绩评价体系中，质量管理业绩（产品或劳务质量、产品缺陷率、质量成本和客户满意度等）占有非常重要的地位。

2、高层管理者非常熟悉全面质量管理的基本观念和相关知识，极力倡导“始于顾客要求、终于顾客满意”的持续改进思想。

3、高层管理者积极确立质量管理长期战略、政策，积极建立、健全质量管理体系并保证其有效运行。

4、高层管理者制定的质量管理业绩目标非常明晰、客观，各部门所承担的质量管理职责划分非常明确。

5、质量管理目标和政策得到全体员工的充分理解。

6、十分有效地使用质量管理小组等各种集体形式鼓励员工参与质量管理。

7、员工对可控的质量管理差错完全承担个人责任并能非常及时地得到质量业绩反馈信息。

8、员工普遍树立内部客户概念、具备极高质量管理意识和知识。

9、员工的优秀质量管理业绩总能获得同事认可，并总能赢得公司的精神和物质奖励。

10、在全公司范围内彻底普及全面质量管理思想，牢固树立全员质量管理观念。

11、极力推行对生产工人专业技能和质量管理相关知识的培训。

12、极力推行对各级经理和质量管理人员的质量管理相关知识技能的培训。

13、高层管理者为组织质量管理培训提供了完全充足的资源（外部专家、场地、设备等）。

二、技术性因素

14、选择供应商时质量因素总是优先于价格因素。

15、定期进行极为完善的年度供应商评级和年内（如每周一次）供应商绩效评价。

16、始终坚持只与少数几个（如1–5个）可靠供应商建立长期业务关系。

17、与供应商进行十分密切的合作以改善各自产品的工艺流程，协助解决质量管理问题。

18、在新产品或劳务设计中全面深入地分析客户要求，始终将客户要求作为质量标准。

19、在新产品或劳务设计中，质量目标总是优先于成本目标和工时目标。

20、新产品或劳务设计中相关部门（营销部门、研发部门、工程部门、质管部门、生产部门）协调十分密切。

21、对产品或劳务的技术标准和生产程序有非常明确的规定。

22、充分使用抽样表、控制图法等各种统计方法进行流程控制。

23、对生产活动和质量检查实行完全自动化管理。

24、对外购货物、在产品和最终产品执行非常严格的阶段性检查。

25、生产计划或任务分配保持极大的均衡性和稳定性。

26、流程设计中竭力保证降低员工各种失误可能性。

27、每个岗位都有非常明确的操作指南。

三、管理性因素

28、具有十分详细准确的质量管理相关数据（如失误率、缺陷率、质量成本和客户满意度）。

29、一线工人、各级经理和质量管理人员总能及时获得重要质量管理相关数据和分析结果。

30、将质量管理相关数据作为各级经理和质量管理人员非常重要考核指标。

31、广泛使用各种基本统计技术（如直方图法、控制图法等）进行数据分析和质量控制。

32、质量管理部门有很高独立性，与高层管理者之间沟通渠道非常畅通。

33、质量管理部门总能对全公司质量管理活动提供专业指导。

34、质量管理部门积极参与具体质量管理问题的解决，并能在各职能部门之间进行十分有效的协调。

第二部分　企业业绩

请选择相对于行业平均水平，贵公司最近三年平均经营业绩和市场业绩的最恰当得分。答案分为九个等级：1＝远远低于行业平均水平，5＝与行业平均水平大致相当，9＝远远高于行业平均水平。

35、产品或劳务的质量和可靠性

36、综合劳动生产率（单位资源投入的适销产品或服务的产出）

37、产品缺陷率（缺陷率越低得分越高）

38、废品与返工等内部损失成本与销售收入的比率（比率越低得分越高）

39、商品退回、投诉与召修等外部损失成本与销售收入的比率（比率越低得分越高）

40、产品生产周期和送货提前期（周期越短得分越高）
41、客户满意度
42、创新产品或创新思想推出的数量
43、竞争地位
44、市场占有率
45、市场占有率的增长幅度
46、营业利润（利润总额扣除非营业性利润）增长率
47、主营业务收入增长率
48、营业利润率（营业利润率＝税前营业利润÷主营业务收入）
49、税前总资产收益率

2008年12月 第10卷 第4期
中 国 会 计 与 财 务 研 究
China Accounting and Finance Review
Volume 10, Number 4, December 2008

AN EMPIRICAL STUDY OF THE RELATIONSHIP BETWEEN TOTAL QUALITY MANAGEMENT AND ORGANISATIONAL PERFORMANCE

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ABSTRACT

An effective management control system (MCS) enhances the efficiency and effectiveness of operating activities, reduces managerial loss, and improves organisational learning ability. Although total quality management (TQM) has been operating in China for many years and has become an important management tool, there are few studies that examine the economic consequences of the critical factors of TQM. Using our comprehensive measuring instrument for TQM and organisational performance, this paper empirically tests the relationship between critical TQM factors and organisational performance. We have identified three factors that are critical to TQM. Using structural equation modelling, we test both the economic consequences of TQM as a whole and the relationship between the three critical factors and organisational performance. Our study shows that the level of TQM implementation is positively correlated with organisational performance. Furthermore, we find that TQM is a complex integrated system in which all three critical factors are interrelated. The critical factors all contribute to the improvement of organisational performance, either directly or indirectly. Our study not only enriches the literature on quality management and management control, but also helps practitioners to better implement their TQM strategies.

Keywords: Total Quality Management, Critical Factors, Performance, Structural Equation Modelling

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I. INTRODUCTION

An effective management control system (MCS) can enhance the efficiency and effectiveness of operating activities, reduce managerial loss, improve organisational learning ability (Burns and Stalker, 1961; Lawrence and Lorsch, 1967), and control corrupt conduct (Perrow, 1986) with the effect of increasing the value of an organisation. The economic reform in China involving privatisation and the opening of markets has radically changed the economic and regulatory environment of state-owned enterprises and other firms and impelled them to join in the market competition. This has led an increasing number of enterprises to rely on advanced management control methods to monitor the performance of their employees, and middle managers are encouraged to focus their objectives and energy on those areas where it is desirable that the organisation improves its performance. One of these important management tools is total quality management (TQM).

In the twenty-first century, product quality is one of the most important components of successful competition. As competition becomes increasingly severe, so TQM has gained increasing popularity world wide. A paper by Benson published in the *Weekly Industry* in 1993 said: "During the past ten years, TQM has become as familiar a way of business thought as the quarterly financial statement". Although TQM has been operated in China for almost 30 years since its introduction in 1978, the overall results have not been satisfactory. Chow *et al*. (2007) and O'Connor *et al*. (2004) placed emphasis on the content of quality management in their survey study about the extent of the application of Western advanced management accounting technologies in Chinese enterprises. The results of their investigation show that the "kaizen" method (continuous improvement), the quality cost report system, and total quality control have all been used by Chinese enterprises to some extent, but the depth and breadth of application still need to be enhanced. With the establishment of a market economy and the intensification of China's opening-up, especially after China joined the WTO, Chinese enterprises face a competition fiercer than they have ever encountered before. The question of how to apply TQM within a theoretical framework in order to create and maintain core competitiveness has therefore become an important research topic.

This study examines the relationship between critical TQM factors and organisational performance in Chinese enterprises. It has the following motivations:

First, it is the first study in China that empirically tests the relationship between TQM and organisational performance in a rigorous manner. Since the 1960s, Western scholars have not only focused on the normative question of whether TQM should be used, they have also provided much empirical evidence on its contribution to improving customer satisfaction, to creating better products and services, and to increasing labour productivity and profits. Over the past 30 years, domestic scholars have written a great deal about TQM; however, almost all the domestic literature focuses on what kind of management techniques enterprises should employ or what issues they should pay attention to when employing those techniques. There is a dearth of literature providing empirical evidence about the current state of the

application of TQM or whether there are factors affecting its application. In particular, there is no rigorous study on whether TQM improves performance and, if it does, how it improves performance (Yusuf *et al*., 2007). Our study is an exploration of the relationship between quality management and performance in China. Its aim is not only to enrich the literature on quality management and management accounting, but also to help management to improve its competence.

Second, unlike previous studies, this paper not only explores the performance effect of TQM as a whole, but also investigates the individual and co-operative effects of critical TQM factors on performance. TQM is an integrated management philosophy, and integrated management is the soul of the quality management process (Ross, 1993). What critical factors are involved with TQM? What is its inherent operating mechanism? What kind of mediating mechanism facilitates its effect on the final financial performance of organisations? It is quite important to find answers to these questions in order to enhance TQM strategy implementation and TQM practice design. Most previous studies have looked at TQM as a single concept or measured it in a simple way; for example, some studies choose "winning a quality award" as the proxy variable for TQM, or they just ask the respondents directly about only a few aspects of their organisation's levels of quality management implementation. This leads to two deficiencies: one is that the measurement is quite imprecise; it cannot reflect all the characteristics of TQM core content (Hackman and Wageman, 1995), and thus the reliability of the results of these studies is impaired; the other deficiency is that the measurement cannot further examine the interdependence of critical TQM factors and their influence on various types of organisational performance. We take a broader perspective in variable measurement for TQM and performance. We empirically test the theoretical model that holistically reflects the interrelationship between critical TQM practices and organisational performance. Our results may provide guidance for practitioners that will enable them to design better TQM practices.

Last, we employ structural equation modelling to examine the direct and indirect effects of critical TQM factors on organisational performance. In practice, organisations simultaneously select managerial accounting and other organisational attributes; this complicates empirical managerial accounting research (Pan and Wen, 2006). Most prior work usually arbitrarily selects one construct as endogenous (i.e. the dependent variable) and the remaining constructs as exogenous (i.e. the independent variables). In these circumstances, exogenous variables are highly correlated with error terms, which causes biased inferences. Fortunately, structural models involving simultaneous equations can greatly alleviate this kind of bias, allowing the researcher to assess whether the hypothesised model is actually consistent with the observed data.

The remaining parts of this paper are arranged as follows: in Section II, we first illustrate the theoretical relationship between TQM and organisational performance, and then develop the research hypothesis. In Section III, we introduce our research method and describe the characteristics of the sample firms. In Section IV, we report the empirical results. The final section concludes the paper.

II. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.1 Literature Review

Advocates of TQM argue that it leads to better firm performance. According to Juran (1988), TQM creates value for a firm because it leads to a better understanding of customer needs, increases customer satisfaction, improves internal communications, enhances an organisation's problem-solving ability, and reduces loss and waste. Milgrom and Roberts (1990) and Wruck and Jensen (1994) considered TQM to be an innovation in organisational technology that enhances capital and labour productivity. This resource-based theory also supports the idea that TQM brings a sustainable competitive advantage to the firms that use it. Although other enterprises may try to imitate a successful TQM firm, it is hard to fully duplicate the heterogeneity of the successful firm's portfolio of resources (Rumelt, 1984).

While the benefits of TQM are widely recognised, there are also significant costs and barriers to implementation, such as substantial training costs, increased documentation and bureaucratic formality, and employee resistance (Powell, 1995). It is therefore important to determine that there are net benefits by examining the link between TQM and performance before introducing it. Western scholars have provided a great deal of evidence about the improvement brought about by TQM in the fields of customer satisfaction, quality of products and service, labour productivity, and profit. Many studies rely on cross-sectional surveys to provide supportive evidence of an association between various attributes and perceived benefits of TQM (see Haim (1993) for a survey of the literature). Some studies also attempt to determine the impact of TQM on corporate performance by directly examining publicly available financial data (such as Hendricks and Singhal, 1996, 1997; Easton and Jarrell, 1998). Nevertheless, there are differing opinions about the predictive significance of various TQM factors for performance. Powell (1995) and Samson and Terziovsky (1999) found that "soft" (supportive) TQM practices, such as leadership and commitment, employee empowerment, and customer orientation, lead to quality improvement and better performance. Forza and Filippini (1998), on the other hand, suggest that quality improvement can only be achieved through "hard" (core) TQM practices, such as process control and product or service design.

For a long time, quality management has been an important related area of management accounting research. Horngren *et al*. (2005) point out that in order to achieve higher quality and faster delivery, managers should identify and overcome a variety of organisational constraints, and management accounting can assist managers to make a series of correct decisions including on quality management (and within this field, for example, on quality cost analysis) under different resource constraints. Meanwhile, quality management also has great influence on the formation and operation of management control systems. Milgrom and Roberts (1990) point out that new manufacturing practices like TQM are syntheses of new technologies, strategies, and organisational forms. Such complex arrangements or practices usually lead to significant changes in the way in which enterprises carry on their business.

Western scholars have proved that an efficient management control system can raise the effectiveness and efficiency of operating activities, decrease management waste, and increase the learning ability of an organisation, and they have also empirically shown the importance of organisational structures and control processes (Kalagnanam and Lindsay, 1999), information systems (Chenhall, 1997), and human resource management (Youndt *et al*., 1996) for the improvement of performance. Moreover, new management control system techniques, such as ABC or strategic cost management, have also been demonstrated to have an effect on performance in Western enterprises (Cagwin and Bouwman, 2002; Ittner *et al*., 2003).

In China, the situation is quite different. The economic reform has fundamentally changed the economic and regulatory environment of enterprises. As market competition increases, and in an uncertain environment, the management control system begins to play an increasingly important role in the operations of enterprises (O'Connor *et al*., 2004). Although TQM has been functioning in China since the economic reforms of the late 1970s, rigorous empirical research on TQM in the country is still rare (Zhao *et al*., 2007). As the reform of corporate property rights in China develops, so the reform process of marketisation gradually speeds up. Under the impact of rapid advances in scientific technology and the increasing opening of markets, China's enterprises are facing far greater pressure from both the domestic and foreign markets, which makes it all the more important for enterprises to enhance their competitive advantage. We predict that there is a positive relationship between the level of implementation of TQM and organisational performance in China's enterprises. A recent survey by Yusuf *et al*. (2007) shows such an association, but our measurement of both TQM and firm performance is much more comprehensive and consistent with the theoretical description of TQM and its benefits.

2.2 Hypothesis Development

This study not only examines the relationship between TQM as a whole and performance, but also explores the interdependence between critical TQM factors and the various effects they have on performance. As indicated in quality management literature, quality management is always regarded as an integrated management philosophy that emphasises, among other things, customer orientation, long-term thinking, continuous improvement, employee involvement, process redesign, the constant measurement of results, and closer relationships with suppliers. The key to the quality management process is to integrate the various aspects of TQM. Mohoram *et al*. (1995) point out that most TQM practices are related to some form of performance improvement.

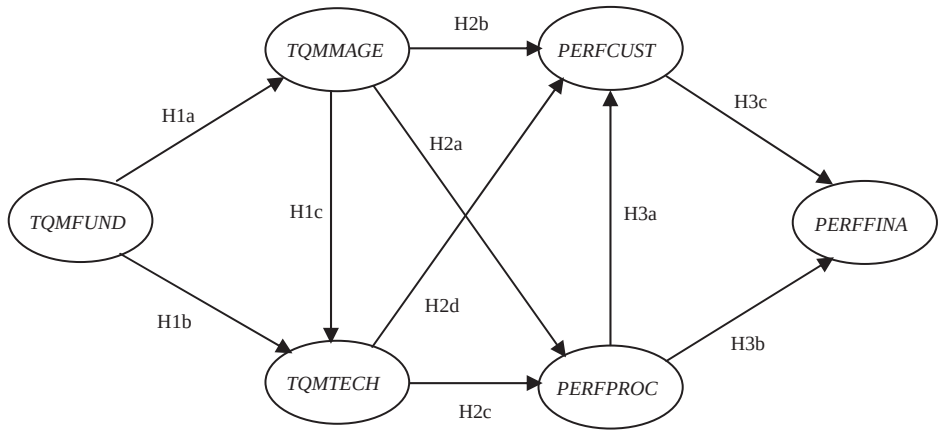
Basing our interpretation on the studies of five authorities on quality, Crosby, Deming, Feigenbaum, Ishikawa, and Juran, we summarise three critical TQM factors: the fundamental factor, the managerial factor, and the technical factor. The fundamental factor reflects the resources and energy devoted by enterprises to cultivating a quality management environment, including leadership and commitment, employee relationships, and education and training. The technical factor reflects

the extent of the application of the TQM philosophy in specific stages of the value chain (design, supply, production, and sale), involving supplier management, product and service design, and process management. The managerial factor reflects the institutional arrangement made by management when organising the daily quality management of the whole organisation, including quality data reporting and the role of the quality management department. We think that these three critical TQM factors may complement one another.

The levels of performance measured vary among the studies. Some research measures performance only at the internal operational level, such as that of Samson and Terziovski (1999), while others studies like that of Douglas and Judge (2001), measure financial performance only. Some researchers, such as Kaynak (2003), measure performance at multiple levels. Kaplan (1983) points out that in a modern production environment, it is not adequate to measure organisational performance by financial performance only; many non-financial indicators are necessary to supplement a comprehensive and timely measure of the performance. Hence, from the literature of quality management and operational management, we identify three kinds of performance related to quality management, namely internal process performance, customer and market performance, and financial performance.

On the basis of the above discussion, we develop the overall hypothesis of this study: each TQM critical factor will rely on and influence the others, and they collectively contribute to organisational performance, making TQM a complex and comprehensive system. To elaborate on our overall hypothesis, we put forward a series of sub-hypotheses on the relationship between critical TQM factors and organisational performance with reference to previous studies on organisational changes, operational management, and quality management. These sub-hypotheses form our research model (see Figure 1). Each path in the model is labelled with an associated sub-hypothesis as follows:

Figure 1 Theoretical Model of the Relationship between TQM Factors and Performance



As documented by authorities on quality management like Deming and Juran, the fundamental practice is an important factor because it provides the basic environment for the implementation of TQM. It is not only a direct "endorsement" of the norms and institutions of managerial practice, but also provides motivations and resource guarantees. Therefore, the fundamental practice improves organisational performance by influencing managerial and technical practices. For example, the successful implementation of TQM requires an effective change in an organisation's culture, but it is almost impossible to change an organisation without the concerted effort of management, an effort that aims at continuous improvement, open communications, and co-operation throughout the value chain. It is the leadership of management that provides the resources necessary for training employees in the application of new principles and tools, and creates a work environment conducive to employee involvement in the process of change. It is management that can establish the role of a quality management department and prescribe the principles for the content, format, and mode of communication of quality data. Management can also establish the purchasing strategy, work out its relationship with upper-stream organisations along the value chain, and ensure the organisation's full involvement in the design of a product or service that meets the demands of customers. Workforce training in the techniques necessary for improving processes must be continuous if the improvement effort is to be sustained. To manage quality, employees must effectively measure and make use of quality data in a timely manner; to achieve this aim, they need to be trained in the use of quality improvement tools. We predict that plentiful training will significantly improve the quality awareness and techniques of employees, with the result that they will be able to complete their tasks along the whole value chain (design, supply, production, and sale) "at a stroke". A good relationship between management and employees facilitates changes, and this relationship should feature employee participation in decision-making, teamwork, and the effective use of communication, to create an awareness of organisational goals. It ensures that employees can make the best use of team effort and team wisdom while collecting and using quality data along the value chain. Thus, we develop the following hypotheses:

H1a: The TQM fundamental factor has a positive effect on the managerial factor.
H1b: The TQM fundamental factor has a positive effect on the technical factor.

The TQM managerial factor is the institutional arrangement for quality management, including quality data reporting and determining the role of the quality management department. It ensures that quality management is implemented in accordance with certain norms and rules. The line departments are all linked with the quality management department on quality issues. The quality management department not only leads and monitors the quality practices of the line departments, but also provides helpful professional advice and technical support. What is more, it can initiate a cross-functional working team to solve important quality issues,

thereby greatly improving the efficiency of the line departments. Well-defined quality data and reporting can facilitate the communication of information vertically and horizontally across an organisation. Such reporting not only helps senior management to make good decisions, but also provides every employee with important benchmarks and feedback to encourage him or her to focus on continuous improvement in order to create and maintain competitive advantage. Therefore, we develop the following hypothesis:

H1c: The TQM managerial factor has a positive effect on the technical factor.

Kaplan (1989) claims that "what you measure is what you get". Ittner and Larcker (1995) argue that some "new" information and reward systems have to be established to extract the greatest benefits from TQM. Specifically, critics of traditional management accounting practices argue that effective TQM also demands information that is more timely and less aggregated than the financial data provided in accounting reports. Rather than providing workers with "top-down" information, such as budgeted standards and variances, problem-solving requires detailed "bottom-up" process information gathered by workers themselves using techniques like statistical process control (SPC), Pareto analysis, and process flow charts. The frequent provision of problem-solving information accelerates the identification and correction of problems, and fosters learning by providing rapid feedback on the relation between a situational condition and the appropriate response. As for customer management, by linking rewards with quality-related performance TQM theory suggests that organisations can foster management commitment to the quality programme, can communicate the significance of TQM to all employees, and can ensure that quality improvement results are considered to be as important as financial results. Generally, well-defined quality data and reporting combined with efficient monitoring and co-ordination by the quality department can fully reflect the above information requirement of TQM. Consequently, we suggest the following hypotheses:

H2a: The TQM managerial factor has a positive effect on internal process performance.
H2b: The TQM managerial factor has a positive effect on customer and market performance.

Quality management in the departments concerned with supply, design, production, and sales determines the effectiveness and efficiency of operations. Specifically, successful relationships with suppliers encourage suppliers to participate in the buying firm's design of products or services, and give the suppliers a chance to offer suggestions regarding the simplification of products or components. Suppliers can also help purchasers to procure those materials and parts that can be used most efficiently. Improving the quality of purchased materials and parts—which are the main source of process variability—will have a positive effect on process management by eliminating variance in materials and parts. This in turn makes it possible to utilise internal controls over such other variables as machinery and the workforce.

One direct contribution that effective supplier management can make to firm performance is inventory reduction (Easton and Jarrell, 1998; United States General Accounting Office, 1991), which enables firms to sustain efforts to reduce waste, cut safety stocks, and create leaner operations. A study by Chapman and Carter (1990) shows that successful co-operation between customers and suppliers can result in an inventory reduction that benefits both parties. As for the design of a product or service, TQM requires "designing quality into products" (Flynn *et al*., 1995). Designing to simplify manufacturing utilises cross-functional teams to reduce the number of parts per product and to standardise the parts, resulting in a more efficient process management by reducing process complexity and process variance. Using as few parts as possible and standardising as many of these parts per product as feasible can speed up the learning curve effect on employees, thereby enhancing quality and reducing costs. Furthermore, by incorporating customers' requirements into the new product or service design, the organisation can manufacture more quality products that meet the customers' requirements; therefore, it should be able to continuously increase its market share and acquire a sustainable competitive advantage. Process management entails the adoption of a preventive approach to quality improvement, such as designing processes that are fool-proof and that provide stable production schedules and work distribution to reduce process variation. Reducing process variation should result in increased output uniformity as well as reduced rework and waste because quality problems are identified and corrected immediately. The increase in production quality leads to improved product quality and, in turn, other improvements in competitive priorities, such as reduced costs and fast delivery. Such considerations lead us to propose the following hypotheses:

H2c: The TQM technical factor has a positive effect on internal process performance.
H2d: The TQM technical factor has a positive effect on customer and market performance.

Companies implementing TQM experience better internal process performance, which is shown in lower scrap and rework costs as well as enhanced productivity and lead-time performance. These improvements should result in higher product quality, greater customer satisfaction, and increased market share. Furthermore, better internal process performance may imply that the internal and external loss components of quality cost are greatly reduced. Therefore, internal process performance can influence financial performance, either directly or indirectly, through customer and market performance; all of which leads us to make the following hypotheses:

H3a: Internal process performance has a positive effect on customer and market performance.
H3b: Internal process performance has a positive effect on financial performance.

H3c: Customer and market performance has a positive effect on financial performance.

III. SAMPLE AND RESEARCH METHODOLOGY

3.1 Questionnaire Design and Distribution

All the data used in this study are sourced from a survey of TQM and performance in Chinese companies. To ensure quality, we designed the questionnaire by taking the following steps. First, after an extensive review of existing literature on quality management, management accounting, and organisations, we constructed a preliminary version of the questionnaire. Second, we invited several management accounting and quality management professionals to review the questionnaire, and made amendments to incorporate their comments and suggestions. Third, we asked three doctoral students and two enterprise managers to fill in the questionnaire and provide feedback on the content, understandability, question types, wordings, length, suitable types of respondent, and the time required to complete the questionnaire. We modified the questionnaire further on the basis of their feedback. For example, we employed more terms commonly used by practitioners and reduced the length of the questionnaire from 16 to 9 pages. The questions occupy 7 pages in total, excluding the cover and the explanatory pages.

We further selected four firms, one from each of the car manufacturing, electronics, construction, and water supply industries, for on-site interviews and pilot tests. Two of these enterprises are foreign-invested, one is state-owned, and the remaining firm is a private enterprise. We conducted face-to-face interviews with a general manager, a financial director, a chief engineer, and a middle-level financial officer using the revised questionnaire and 18 open-ended questions prepared in advance. The interviews provided us with useful information about the practice of TQM and MCS, as well as some descriptive evidence that appears to be consistent with our hypotheses. After the interviews, we left the questionnaires for them to complete and return. We then made some minor adjustments based on the information gathered during the interviews.

To ensure an acceptable rate of response, we decided not to use a random sample. Instead, we obtained a list of business enterprises through executive training classes that we have access to. A designated contact person in each firm was identified, and we sent the questionnaire to this person by post or email. On the explanatory page, we clearly stated that the questionnaire should be completed by a managerial individual who was familiar with quality management, management control, and firm performance. We also suggested that more than one individual could be involved in completing the questionnaire if deemed necessary. For late-responding firms, we made phone calls or sent emails, through the contact person, to urge them to respond. Our access and effort resulted in a generally satisfactory survey in terms of both the rate (47.59 per cent) and the number (237) of responses.

3.2 Variable Measurement

TQM

Our TQM survey instrument is constructed, with certain modifications and simplifications, on the basis of the literature (e.g. Saraph *et al*., 1989; Flynn *et al*., 1994; Ahire *et al*., 1996; Black and Porter, 1996) and of the Malcolm Baldrige National Quality Award promoted by the US Department of Commerce. As shown in the Appendix, we measure eight components of TQM including leadership and commitment, employee relationship, training and education, supplier quality management, product or service design, process management and operating procedures, quality data and reporting, and the role of the quality management department. Each component consists of 3 to 6 questions, with a total of 34 questions. Respondents indicate the level of TQM practice on a nine-point Likert-scale.

Organisational Performance

In conformity with many studies on management accounting (Chenhall, 2003), we employ the measure of perceived organisational performance. Like Kaynak (2003), we measure firm performance in three dimensions, including internal process performance, customer and market performance, and financial performance. As shown in the Appendix, internal process performance measures the product defect rate, the costs of scrap and rework, the costs of handling returned goods, maintenance, and production cycle and lead time. Customer and market performance includes factors of the following: quality and reliability of the product or service, customer satisfaction, innovation, competitive position, market share, and growth of market share. Financial performance is measured by the growth of operating profits, the growth of sales, the operating profit margin, and return on assets. For each performance measure, respondents indicate the level of performance relative to the industrial average on a nine-point Likert-scale.

3.3 Sample Description

We surveyed business enterprises from a wide range of industries in China from August 2005 to March 2006. Altogether 498 questionnaires were distributed and 243 were returned, of which 237 were valid, corresponding to an effective response rate of 47.59 per cent. The 237 sample companies operate in all of the 22 industries classified by the China Securities Regulatory Commission (CSRC) including labour-, capital-, and technology-intensive industries. A large percentage of the respondents came from manufacturing industry, including the machinery, equipment, and meter industries (14.3 per cent), electronics (13.9 per cent), and textiles, apparel, and fur (11.4 per cent). The wide distribution of industries suggests that our sample firms are likely to be representative. Table 1 contains information about the sample firms and the respondents.

The sample consists mainly of medium- to large-sized enterprises. Small firms with less than 100 employees account for only 13.4 per cent of the sample, while enterprises having 100 to 499 employees represent 29.4 per cent, those with 500 to 1,999 employees 31.6 per cent, those with 2,000 to 9,999 employees 19.5 per cent,

Table 1 Characteristics of Sample Companies and Respondents

	Quantity	Percent
Panel A: Number of Employees		
0–99	31	13.4
100–499	68	29.4
500–1,999	73	31.6
2,000–9,999	45	19.5
10,000 or above	14	6.1
Sub-total	231	100.0
Missing values	6	
Total	237	
Panel B: Position of Respondents		
Top management	59	25.9
Middle management	131	57.5
Other managerial personnel	35	15.4
Unknown	3	1.3
Sub-total	228	100.0
Missing values	9	
Total	237	
Panel C: Years of Service of Respondents		
1–2 years	47	21.3
3–5 years	74	33.5
6–9 years	44	19.9
10 years or above	56	25.3
Sub-total	221	100.0
Missing values	16	
Total	237	

and those with more than 10,000 employees 6.1 per cent (Panel A, Table 1). The questionnaires were completed mostly by middle (57.5 per cent) or senior management (25.9 per cent) (Panel B, Table 1). Among the 221 respondents disclosing their years of service, 78.7 per cent had served for more than three years, 45.2 per cent for more than six years, and 25.3 per cent for more than 10 years. This indicated that the respondents were likely to possess the experience and knowledge necessary to complete the questionnaires (Panel C, Table 1).

3.4 Structural Equation Model

The structural equation modelling approach is used to test out hypotheses. In contrast to regression models, the structural equation model (SEM) links unobserved (latent), hypothetical constructs rather than concrete, empirical indicators. The principal advantage of the SEM approach is that it goes beyond conventional linear models and accounts for measurement errors; it also allows for simultaneous estimates of measurement and structural parameters, and hence provides diagnostic

statistics or information for the model as a whole (Jöreskog and Sörbom, 1979). Therefore, SEM is an appropriate technique for estimating interrelated dependence relationships, such as those proposed in this study. The model in this study comprises six latent variables: the TQM fundamental factor, TQM managerial factor, TQM technical factor, internal process performance, customer and market performance, and financial performance. Since each of our latent variables is measured based on multiple items in the questionnaire, we follow a two-stage analysis. During the first stage, we test our proposed measurement model, including estimated parameters, for all latent variables; during the second stage, we fix our measurement model and estimate our structural model for hypothesis testing. We use the statistical package AMOS 5.0 to test all our hypotheses using the SEM.

IV. EMPIRICAL RESULTS

4.1 Measurement Model—Overall Fit

Prior to evaluating the structural equation model (SEM), the validity of the measurement models is tested (Byrne, 1998; Jöreskog and Sörbom, 1993). In the measurement model, each of the 49 questionnaire items (see Appendix) is proposed and confirmed to be an indicator of its associated latent variable only. Since we specify in advance the items that should be loaded onto each factor, the confirmatory factor analysis (CFA) is more appropriate than the exploratory factor analysis (Long, 1983; Segars and Grover, 1993; O'Leary-Kelly and Vokurka, 1998). We choose the maximum-likelihood estimation method, which has been found to provide good parameter estimates even if the data deviate from those of a normal distribution (Chou and Bentler, 1995).

To see if the model fits well with the data, we need to compare the implied covariance matrix with the sample covariance matrix. The difference between the two matrices can be expressed by a comprehensive index (fit function), in which χ^2 is the basic index. Under certain conditions, the χ^2 calculated using a normal statistical method is normally distributed asymptotically. The bigger χ^2 is, the larger is the difference between the implied covariance matrix and the sample covariance matrix. Given the significance level, if χ^2 is greater than the critical value, the model is thought to fit badly with the data; otherwise, if χ^2 is less than the critical value, the model is thought to fit well with the data. However, directly using χ^2 to test and infer whether the model fits well with the data is not suitable. The problem is that the magnitude of χ^2 is influenced by the sample size (N); that is, the smaller N is, the smaller is χ^2. Under these circumstances, even if the proposed model is greatly different from the "true" model, the result will make an impression of good fit. On the other hand, even if there is only a minor difference between the proposed model and the "true" model, the proposed model may still be thought to fit badly with the data (Hou *et al*., 2004). To solve this problem, over 40 goodness-of-fit indices used to assess and select the model have emerged in the literature, most of which are based on χ^2, but with some modifications.

To assess whether the model fits the data, we mainly examine the standard errors, *t* values, standardised residuals, modification indices, and a number of goodness-of-fit statistics (Jöreskog and Sörbom, 1993). The fit indices used in this study to estimate the measurement models are the ratio of χ^2 to degree of freedom, the root mean square error of approximation (RMSEA), a consistent version of the Akaike's information criterion (CAIC), the Parsimony Goodness-of-Fit Index (PGFI), the Parsimony Normed Fit Index (PNFI), and the Comparative Fit Index (CFI). These fit indices are most often used to assess the goodness of fit of a model. They include all tree categories of index—absolute fit indices, relative fit indices, and parsimonious fit indices. These fit indices, with the exception of RMSEA, all have the ability to adjust for model complexity and degrees of freedom. Although RMSEA is sensitive to model complexity, it is one of the most informative criteria for measuring an absolute fit (Byrne, 1998).

During the estimation of the measurement models for TQM and perceived performance constructs, an examination of the modification indices and standardised residuals reveals some redundant items. These redundant items are eliminated to obtain better-fitted models (Byrne, 1998). A comparison of goodness-of-fit statistics relating to the TQM measurement model with the recommended values of these fit indices (Panel A, Table 2) reveals a satisfactory fit of the TQM measurement model to the data. The remaining items in each factor as well as their standardised factor loadings on the respective factors are shown in Panel B of Table 2.

A comparison of the goodness-of-fit statistics relating to the performance measurement model with the recommended values of these fit indices (Panel A, Table 3) reveals a satisfactory fit of the performance measurement model to the data. The remaining items in each factor as well as their standardised factor loadings on the respective factors are shown in Panel B of Table 3.

The mean values, standard deviations, bivariate correlations, and Cronbach's alphas for refined scales are presented in Table 4. The bivariate correlation coefficients of all latent variables are significantly positive, providing preliminary proofs of our hypotheses. Later we will formally test our hypotheses with all the latent variables in the structural model to obtain conclusive results.

4.2 Reliability and Validity Test

In addition to the overall model fit, we also analyse the reliability and validity of the constructs. We rely on the Cronbach's alpha to assess construct reliability. The Cronbach's alphas for TQM fundamental, managerial, and technical factors are 0.949, 0.914, and 0.917, respectively. The Cronbach's alphas for internal process, customer and market, and financial performance are 0.902, 0.784, and 0.912, respectively. We can see that the Cronbach's alphas for all six factors are well above 0.7 (Nunnally and Bernstein, 1994), indicating that the reliability is satisfactory.

Construct validity consists of three components: uni-dimensionality validity, convergent validity, and discriminant validity. Uni-dimensionality means that each set of alternate indicators has only one underlying trait or construct in common. Although both exploratory and confirmatory factor analyses can be used to assess

Table 2 Confirmatory Factor Analysis of TQM (N = 237)

Panel A: Assessment of Measurement Model for TQM

Goodness-of-fit statistics	Measurement model for TQM	Recommended values for satisfactory fit
χ^2/df	707.71/272 = 2.602	<3.0[a]
RMSEA	0.082	<0.08[b]
CAIC	1,124.899	<saturated model and independence model[c]
CAIC for the saturated model	2,270.289	
CAIC for the independence model	5,472.127	
PGFI	0.671	>0.5[d]
PNFI	0.783	>0.5[d]
CFI	0.911	>0.9[b]

[a] Bollen (1989), Carmines and Mclver (1981), Hair *et al*. (1995).
[b] Byrne (1998), Jaccard and Wan (1996), Jöreskog and Sörbom (1993).
[c] Byrne (1998), Jaccard and Wan (1996), Jöreskog and Sörbom (1993).
[d] Byrne (1998), Mulaik *et al*. (1989).

Panel B: Confirmatory Factor Analysis

TQM questions	Contents of questions	Factor loadings
	TQM fundamental factor	
Q1	Importance of quality performance for management	0.647
Q3	Managerial enthusiasm to promote TQM	0.779
Q4	Clarity of objectives and managerial responsibilities	0.821
Q5	Employee understanding of the TQM strategy	0.779
Q6	Employee TQM teams or task forces	0.827
Q7	Employee individual responsibilities	0.766
Q8	Employee awareness and knowledge of TQM	0.872
Q9	Reward of employee quality performance	0.816
Q10	Dissemination and education of TQM concepts	0.873
Q11	Management TQM training	0.796
Q13	Adequate resources for TQM training	0.732
	TQM managerial factor	
Q28	Comprehensiveness and accuracy of quality data	0.733
Q31	Application of statistical methods	0.701
Q32	Independence of TQM department	0.846
Q33	Professional coaching by TQM department	0.942
Q34	Participation and co-ordination of TQM department	0.930
	TQM technical factor	
Q14	Quality on higher priority when selecting a supplier.	0.604
Q17	Close co-operation with suppliers in TQM	0.760
Q18	Satisfaction of customer requirements in product design	0.703
Q20	Close inter-departmental co-ordination in product design	0.806
Q21	Clear standards and procedures	0.774
Q23	Automation of quality inspection	0.690
Q24	Tight inspection of materials and goods	0.801
Q25	Stability of production plans or task assignments	0.790
Q27	Operating procedures clearly and explicitly stated	0.767

Table 3 Confirmatory Factor Analysis of Performance (N = 237)

Panel A: Assessment of Measurement Model for Performance		
Goodness-of-fit statistics	Measurement model for performance	Recommended values for satisfactory fit
χ^2/df	103.24/41 = 2.518	<3.0
RMSEA	0.080	<0.08
CAIC	264.938	<saturated model and independence model
CAIC for the saturated model	426.892	
CAIC for the independence model	1,749.034	
PGFI	0.575	>0.5
PNFI	0.700	>0.5
CFI	0.962	>0.9
Panel B: Confirmatory Factor Analysis		
TQM questions	Contents of questions	Factor loadings
	Internal Process	
Q37	Rate of product defects	0.867
Q38	Internal failure costs to sales	0.901
Q39	External failure costs to sales	0.876
Q40	Production cycle and delivery lead time	0.703
	Customer and Market	
Q36	Overall labour productivity	0.663
Q42	Quantity of innovative products or idea	0.606
Q43	Competitive position	0.820
Q44	Market share	0.727
	Financial Performance	
Q46	Growth of operating profits	0.855
Q48	Operating profit margin	0.925
Q49	Return on assets	0.868

uni-dimensionality, Anderson and Gerbing (1988) argue convincingly that the latter is more appropriate. As we have already discussed uni-dimensionality when assessing the overall fit of measurement model, the following will only analyse convergent validity and discriminant validity.

Convergent validity means the extent to which multiple attempts to measure the same constructs are in agreement. An instrument has convergent validity if the correlations between measures of the same construct using different methods are high. In measurement studies, each item in the scale can be considered a different method for measuring the construct (Ahire *et al*., 1996). A test of each item's

Table 4 Descriptive Statistics, Bivariate Correlations, and Cronbach's Alphas (N = 237)

Variable	1	2	3	4	5	6	Mean	S.D.	Cronbach's α
1. *TQMFUND*	1.000						6.150	1.538	0.949
2. *TQMMAGE*	0.749***	1.000					5.996	1.604	0.914
3. *TQMTECH*	0.843***	0.820***	1.000				6.180	1.417	0.917
4. *PERFPROC*	0.405***	0.433***	0.421***	1.000			6.175	1.387	0.902
5. *PERFCUST*	0.456***	0.448***	0.492***	0.633***	1.000		5.969	1.192	0.784
6. *PERFFINA*	0.249***	0.188***	0.254***	0.302***	0.617***	1.000	5.676	1.417	0.912

Notes:
TQMFUND: fundamental factor
TQMMAGE: managerial factor
TQMTECH: technical factor
PERFPROC: internal process performance
PERFCUST: customer and market performance
PERFFINA: financial performance
*, **, and *** represent significance levels below 0.1, 0.05, and 0.01, respectively.

coefficient is used to assess convergent validity. If each item's coefficient is greater than twice its standard error (*t* value), then the measures indicate high convergent validity (Krause, 1999). The *t* value of each retained item is significant, indicating high convergence validity.

Discriminant validity refers to the degree to which the measures of different factors are discrete. An instrument has discriminant validity if the correlations between measures of different factors using the same method of measurement are lower than the reliability coefficients. In our study, the correlation coefficients of every factor with other factors are lower than their reliability coefficients, suggesting that the measures have discriminant validity (see Table 4).

4.3 Test Results of Structural Model

To test our hypotheses, we first assess the model using a series of nested models beginning with the least constrained model—one that includes all the paths shown in Figure 1. To do this, some of the paths in the model are constrained (setting the path equal to 0), preventing them from being estimated subsequently. The sequence of nested models is determined by eliminating the least significant parameter (setting the path equal to 0). Following the procedure that Anderson and Gerbing (1988) suggest, we compute the chi-square differences between each of the nested models and test them for significance by taking into account the differences in the degrees of freedom. As a rule, if the change in the chi-square is not significant, the model with the constrained path is a better fit. A significant change in the chi-square indicates that the constrained path should not be removed. We continue this process until no further improvements can be made and the model is the most parsimonious. After deleting two paths (one from the TQM managerial factor to customer and market performance, the other from internal process performance to financial performance), this analysis produces the final modified hypothesised model.

The goodness-of-fit statistics used to assess the fit of the data to the hypothesised model are the same as those used to test the measurement models and are presented in Panel A of Table 5. In the light of recommended values of fit indices, a review of the goodness-of-fit indices pertaining to the hypothesised model reveals a good fit of the model to the data.

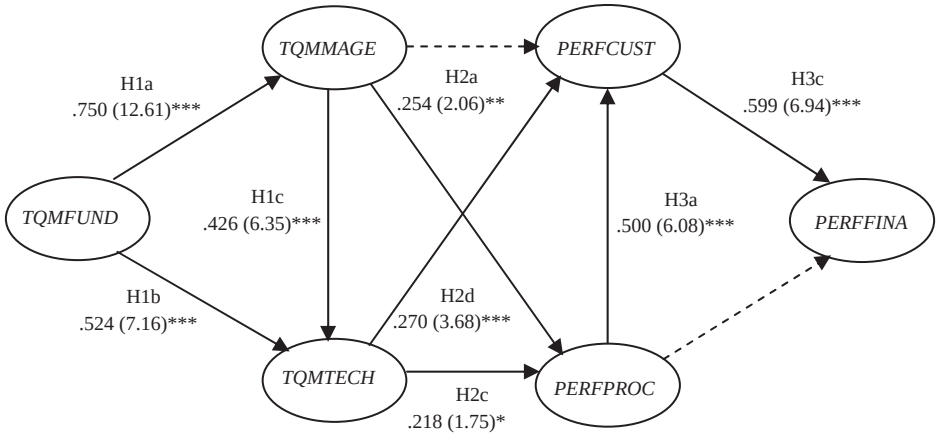
Panel B of Table 5 depicts the SEM results of the relationship between TQM practices and factors of performance measures (shown with the solid lines). Solid paths in the figure indicate the associated hypotheses as well as the estimated path coefficients and *t* values (in parentheses). The dashed lines represent the two deleted paths. The result shows that eight of the 10 hypotheses have passed the test, in other words, all except H2b and H3b. The direct positive effect of the TQM managerial factor on customer and market performance (H2b) is not supported; this may be because in Chinese organisations, the main role of the quality management department is to control internal processes rather than to respond to customer requirements. The direct positive effect of internal process performance on financial performance is not supported; this may be because in Chinese organisations, although internal process performance cuts down the cost of internal and external losses, it also

Table 5 The Results of Structural Model (N = 237)

Panel A: Assessment of Structural Model

Goodness-of-fit statistics	Structural Model	Recommended Values for Satisfactory Fit
χ^2/df	1200.99/586 = 2.049	<3.0
RMSEA	0.067	<0.08
CAIC	1,718.438	<saturated model and independence model
CAIC for the saturated model	4,307.728	
CAIC for the independence model	7,556.625	
PGFI	0.687	>0.5
PNFI	0.778	>0.5
CFI	0.908	>0.9

Panel B: Results of Structural Model



1. The standard path coefficients and associated *t* values (in parentheses) are listed near the solid paths.
2. *, **, and *** represent significance levels below 0.1, 0.05, and 0.01, respectively.

largely increases the prevention and appraisal costs. Thus, the total quality cost does not decrease significantly. This implies that of the two approaches to boost financial performance, increasing revenue and decreasing cost, the former has achieved satisfactory results while the latter has much room to improve.

Table 6 displays the direct and indirect effects of critical TQM factors on performance and *vice versa*.

From Panel B in Table 5 and Table 6, we draw the following conclusions:

1. There are close relationships among critical TQM factors. The fundamental practice is essential for the effective implementation of TQM. It not only posi-

Table 6 The Results of Structural Model (N = 237)

Dependent variable	Independent variable	Direct effect	Indirect effect	Total effect
TQMMAGE:	*TQMFUND*	0.750		0.750
TQMTECH	*TQMFUND*	0.524	0.320	0.844
	TQMMAGE	0.426		0.426
PERFPROC	*TQMFUND*		0.374	0.374
	TQMMAGE	0.254	0.093	0.347
	TQMTECH	0.218		0.218
PERFCUST	*TQMFUND*		0.415	0.415
	TQMMAGE		0.288	0.288
	TQMTECH	0.270	0.109	0.379
	PERFPROC	0.500		0.500
PERFFINA	*TQMFUND*		0.249	0.249
	TQMMAGE		0.173	0.173
	TQMTECH		0.227	0.227
	PERFPROC		0.300	0.300
	PERFCUST	0.599		0.599

tively affects the implementation level of technical practice directly, but also positively affects technical practice indirectly through managerial practice. Thus, the technical practice level is affected by both fundamental and managerial practices.

2. Critical TQM factors have no direct effect on financial performance, but they can have an indirect effect on it by improving internal process performance and customer and market performance. Among other factors, technical practice has positive effects on both internal process performance and customer and market performance; managerial practice has direct positive effects on internal process performance only, but it has positive influence on customer and market performance through the TQM technical practice and internal process performance. Fundamental practice has no direct effect on any kind of performance, but it has an indirect effect on them through the managerial practice and technical practice.
3. There is an inherent transmitting mechanism among different kinds of performance. The improvement of customer and market performance can raise financial performance directly through income expansion. Internal process performance can positively affect financial performance indirectly through its effect on customer and market performance. However, internal process performance does not make any direct contribution to financial performance because it does not decrease overall cost.
4. In sum, TQM practice in China does make a significant contribution to performance improvement.

V. CONCLUSION

Our study provides evidence that there is a positive relationship between TQM and organisational performance using a comprehensive instrument designed for TQM and organisational performance. TQM has been operated in China for many years, but there is little empirical evidence about critical TQM factors and their consequences for performance. Although Yusuf *et al*. (2007) show such an association, our measurement of both TQM and firm performance is much more comprehensive and consistent with the theoretical description of TQM and its benefits. What is more important is that we use confirmatory factor analysis to validate three critical TQM factors and test the relationship between these critical TQM factors and organisational performance. Our study finds that TQM is a complex integrated system, and each of its critical factors needs to rely on and co-operate with the others to promote the improvement of various aspects of performance.

Our study provides important empirical support both for the TQM performance effect in China and for its inherent operating mechanism. This not only enriches the literature on quality management and management control, but should also encourage enterprises that have adopted or are ready to adopt TQM. More importantly, our study may provide a scientific guideline for practitioners to implement TQM strategies correctly. Our study indicates that there are close relationships between TQM fundamental practice, managerial practice, and technical practice, and excellent performance is the result of the implementation of TQM by all staff at every level in an organisation. Organisations should take note of the inherent relationships between critical TQM factors and between critical TQM factors and various kinds of performance, should make suitable designs for TQM practice, and should employ effective co-ordinations and controls when implementing TQM. Only by putting these measures into effect can the maximum benefits of TQM be realised.

REFERENCES

Please refer to pp. 68–71.

APPENDIX—SURVEY QUESTIONS

Total Quality Management

Indicate your agreement with the following statements regarding your company practices from 1 to 9 (1 = do not agree at all, 5 = basically agree, 9 = completely agree).

A. Fundamental Factor

1. In the performance appraisal of senior management, quality measures (product or labour quality, product defects, quality costs, customer satisfaction, etc) play a very important role.
2. Senior management is very familiar with the concept and knowledge of total quality management, and strongly promotes the continuous improvement idea of "start with customer demand, and end up with customer satisfaction".
3. Senior management actively develops long-term strategies and policies on quality management, and establishes sound quality management systems.
4. Senior management sets up clear and objective quality management targets, and explicitly divides quality management responsibilities among all departments.
5. All employees fully understand quality management targets and policies.
6. Quality circles and quality improvement teams are effectively used to encourage employees to participate in quality management.
7. Employees take full responsibility for controllable quality errors and are provided with timely feedback on quality performance.
8. All employees are familiar with the concept of internal customers, and are highly aware of and knowledgeable about quality management.
9. Employee quality performance is always recognised by co-workers and rewarded by the company both spiritually and monetarily.
10. The concept of total quality management is disseminated throughout the company, and the belief in quality management is firmly rooted in all employees.
11. Training in technical skills and quality management is actively provided for all production workers.
12. Training in quality management knowledge and skills is actively provided for managers and quality management staff at all levels.
13. Senior management provides adequate resources, such as external consultants, facilities, and equipment, for quality management training and education.

B. Technical Factor

14. Quality always has a higher priority than price when selecting a supplier.
15. A comprehensive appraisal of supplier performance is conducted annually in addition to continuously monitoring and assessing suppliers throughout the year.
16. Long-term business relationships are always maintained with only a few reliable suppliers (e.g. one to five suppliers).

17. Close co-operation with suppliers is emphasised to improve each other's processes and solve quality problems.
18. Extensive and in-depth analyses are conducted on customer requirements for a new product/service design, and quality standards are always based on customer needs.
19. Quality objectives always have a higher priority than costs and time concerns in a new product/service design.
20. Close co-ordination exists among departments (marketing, research and development, engineering, quality management, and production) involved in a new product/service design.
21. Explicit requirements are stipulated for technical standards and production processes in a new product/service design.
22. Process control is carried out by fully utilising statistical methods, such as the sampling table and control chart.
23 Production activities and quality inspection are automated.
24. Strict inspection is carried out for materials, work-in-progress, and finished goods.
25. Balance and stability are maintained for production plans and task allocation.
26. Production processes are designed to minimise employee errors.
27. Operating procedures are clearly and explicitly stated for each job position.

C. Managerial Factor

28. Detailed and accurate quality data are available including on the failure rate, defect rate, quality costs, and customer satisfaction.
29. Important quality data and analyses are always provided on a timely basis to front-line workers, managers, and quality management staff at all levels.
30. Quality data are used extensively in appraisals of managers and quality management staff at all levels.
31. Data analyses and quality controls are heavily based on statistical methods, such as histograms, control charts, and so on.
32. The quality management department is highly independent, and there is a smooth channel of communication with senior management.
33. The quality management department always provides professional guidance for the quality management activities of the entire company.
34. The quality management department effectively co-ordinates functional departments and actively participates in solving specific quality management problems.

Firm Performance

Indicate the average performance of your company for the past three years in relation to the industry average from 1 to 9 (1 = much lower than the industry average, 5 = more or less the same as the industry average, 9 = much higher than the industry average).

35. Quality and reliability of products/services
36. Labour productivity (output of products or services per unit input of resources)
37. Product defect rate (the lower the defect rate, the higher the score)
38. Ratio of costs of scrap and rework to sales (the lower the ratio, the higher the score)
39. Ratio of costs of handling returned goods, complaints, and maintenance to sales (the lower the ratio, the higher the score)
40. Production cycle and lead time (the shorter the cycle, the higher the score)
41. Customer satisfaction
42. Number of innovative products or ideas launched
43. Competitive position
44. Market share
45. Growth of market share
46. Growth of operating profits (gross profits excluding non-operating profits)
47. Growth of sales
48. Operating profit margin (operating profit margin = pre-tax operating profit ÷ sales)
49. Return on assets