"What We Cannot Speak about We Must Pass over in Silence" – (In)correctly Arguing and Comparing the Costs of IT Investments in Public Sector

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Abstract. In our era of increasing capitalism a cost-based reasoning is often used, also in public sector, for arguing and comparing the costs within and between different institutions. One of the approaches is the total cost of ownership (TCO) where the costs are approached holistically so that, for example, IT costs per workstation, per person, or per IT staff can be presented. TCO is then used in arguing that a certain IT investment is needed because their TCO is better, worse, or different than of the others' TCO. In this paper we argue that this approach is incorrect and does not provide reliable basis for arguments or comparisons. We demonstrate this through analyzing three ministries' IT expenditures and a purchaser-provider split model and its pricing structure. We propose that as we cannot provide a reliable basis for cost-based reasoning, we should not speak about it but pass it over in silence. The need for new metrics and methods is thus evident.

Keywords: E-government, TCO, costs, purchaser-provider split, IS management.

1 Introduction

Currently public sector is facing a crisis. Taxes shrink while unemployment is increasing. Desperate need to cut the costs puts public services at risk, while citizens urge for both the supply of old services and the development of new ones. Information technology (IT) is seen as a means to rationalize or improve the services and appropriate processes but also as a cutting target. Every new investment ought to be carefully analyzed before an investment decision is made. For instance in Norway, every new IT project in public sector should result better services (for citizens), more effective operations, or cost savings [1]. Counter-intuitively, it seems that IT expenditures in Finnish public sector are increasing despite that more services are outsourced [2-4].

Different costs range from acquisition costs (hardware and software) and control costs (centralization and standardization) to operations costs (support, evaluation, installation or upgrade, training, downtime, personal use, auditing, security, and power consumption) [5]. Often a total cost of ownership (TCO; [6]) approach is used

in arguing the costs. For example, TCO can be calculated per workstation, per server, per employee, or per IT staff. This provides means for comparing the organizations or departments, and of their IT expenditures. Then the organizations reason that certain investment need to made because their TCO is less, more, or different than the others. In other words, they make some assumptions, calculate and acquire TCO's from different organizations, and compare the results. The cost estimation may prove difficult due to the hidden costs related to the investments [7].

In this paper, we present several issues why utilization of TCO in reasoning IT investments, particularly in public sector, is misleading. We will demonstrate this by an analysis of IT budgets of different Finnish ministries, and by examining the impact of the purchaser-provider split of organizing public services. By so doing, we argue that reasoning the costs and prices for functional purchaser-provider split model is practically impossible, and leads to a sub-optimized and inefficient situation from the public sector point of view.

The paper is organized as follows. First TCO and related research are presented. Then, an analysis of Finnish government IT costs and organization is performed in order to illustrate the differences between the TCOs. Third, purchaser-provider model is elucidated. The paper ends with discussion and concluding chapters.

2   TCO and Related Research

Usually, and as the latter analysis of Finnish government ICT reviews reveal, the reasoning behind the IT investments is first to ensure certain level of quality for each potential solution, after which their prices and costs can be compared. Also the benefits can be considered [8]. Yet the public servants have lost interest in detailed analysis of the benefits [1]. This lack of interest of measuring and evaluation the benefits of IT investments has been widely demonstrated (e.g. [8-12]). Frisk and Plantén [8] stated that the benefits are usually evaluated at the feasibility stage, not later. This is supported by Ashurst et al. [12] statement that benefits should be monitored throughout the lifecycle of an IT investment – although in practice they are not. These studies show that the focus of IT investments and IT projects is on costs leaving the benefits with lesser interest.

The focus on costs, particularly on public sector, is understandable as there is a constant pressure to save money and provide better or at least same quality services. Particularly purchaser-provide split [13] has been seen as a mean to reduce costs. To make the cost calculations and comparisons possible, TCO has been adapted to measure the effectiveness of organizations expenditures. It has been utilized in several domains (e.g. [14-16]) although in IS domain it has been seldom studied. This is surprising as TCO provides "*a holistic view of costs related to IT acquisition and usage at an enterprise level*" [6]. Yet the attempts to measure the effectiveness of IT on such level of details has proven to be difficult – many of the effects and implications are not quantifiable or comparable, or benefits, values and indirect implications have been ignored (c.f. [17, 18]), or it is focusing solely on technology costs [19]. However, for the purpose of this study, the utilization of TCO as a basic metric is feasible as our focus is only on the costs and their conceptualization.

TCO makes a holistic approach to a context. For example, it has been used to measure the costs of communities of practice [19], to analyze different software platform options [20] or application service providers [21], to identify the measures of business intelligence [22], and to analyze network and systems management in general [23] and at schools [24]. David et al. [5] performed a comprehensive literature review on different cost factors implying on IT TCO. They divided the costs on three categories: acquisition costs, control costs and operations costs. Acquisition costs include all costs spent on hardware and software while operations costs consists of support, evaluation, installation or upgrade, training, downtime, futz (personal use; [25]), auditing, virus, and power consumption costs. Control costs consider the costs of centralization and standardization.

Yet, although these studies, among many others, attempt to partially conceptualize the costs and value of IT (investments), the complexity of the issue makes it very difficult to evaluate (c.f. [26-28]). For instance David et al. [5] stated that different costs are related to one another in a complex way. This argues for simpler measures. Reichman and Staten [28] proposed the use of relative cost of operations/ownership (RCO), which, instead of trying to encapsulate the whole TCO of IT investment, focuses on factors that distinguish different alternatives.

The costs in general have been tackled very seldom in e-government research. One rare example is the procurement of IT, where the costs have been seen as a rationale behind the investment (e.g. [29-31]) but they are not on focus *per se*. Usually, in e-government literature, the costs are seen only as an impact of information systems implementation aiming to improve the processes' cost-effectiveness (c.f. [32, 33]).

3   An Analysis of IT Budgets of Finnish Ministries

In order to illustrate the difficulties of evaluating and comparing IT investment costs, we analyzed IT budgets of Finnish ministries by utilizing public data from Ministry of Finance (see e.g. [4]). We collected the data from annual reports in 2000-2009. For instance, in 2008, the IT budgets were 802,5M€, that being in average 9,8% of the ministries' total budgets. In IT departments there were 4281 employees (3,9% of all employees), with labor input 5071 person years. These people were administrating more than 166 000 workstations and 9000 servers.

According to the ICT reviews, total IT budgets increased rapidly from 2000 to 2008 (from 458,3M€ in 2000 to 802,5M€ in 2008)[1]. The ministries have also started to acquire more IT solutions as services thus outsourcing and consultancy costs have boomed for every ministry. However, at the same time personnel costs became stable. However, this is just an example. The only "fact" is that outsourcing and consultancy is getting more popular and expensive. The figure or data does not provide any means to evaluate whether outsourcing and consultancy costs are absolutely greater or relatively more expensive between ministries, or whether the ministries have changed their IT service structure or model. Figure 1 illustrates the development of TCO per workstation in three ministries. It provides a theoretical basis for comparative analysis whether a ministry is organizing their IT "better" than the other ministries.

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[1] Inflation rate no considered. Inflation rate corrected budget for 2008 should be 528,4M€. This means that the costs have increased 59,8%.
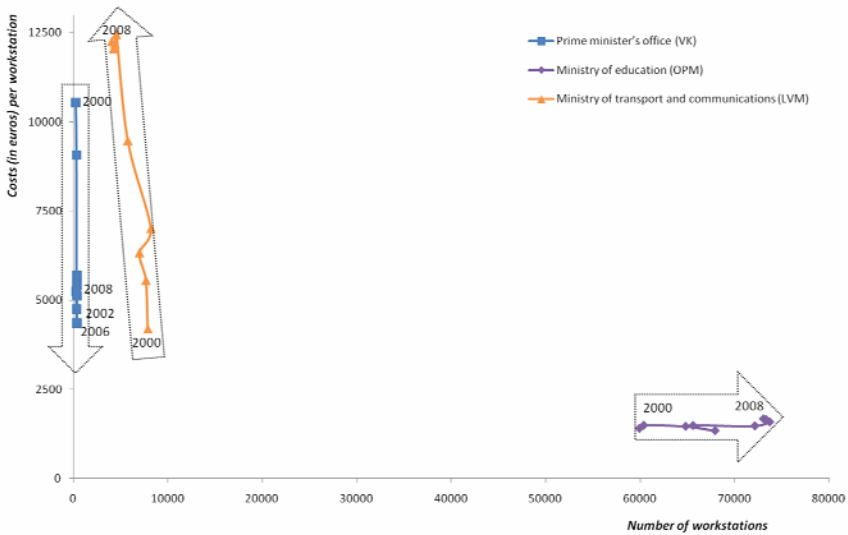
Fig. 1. Time series of total number of workstations (x-axis) and TCO / workstation (y-axis) in three different ministries (big arrows illustrating general trend from 2000 to 2008)

Figure 1 presents the development of TCO per workstation over time for each ministry. For instance, Ministry of Education has managed to keep their IT costs per workstation quite stable over nine years – although their number of workstations has increased from 60000 to 75000. On the other hand, Prime minister's office has managed to cut down their IT costs during the first three years after which they have increased moderately. The number of workstations has remained about the same. Third, Ministry of Transportation and Communication had 8000 workstations and TCO of 4100€ in 2000. In 2008 they had about the same number of workstations while TCO per workstation had trebled.

What do these numbers tell us? Is Ministry of Education organizing their IT better than others as their TCO per workstation has remained stable even the number of workstations has increased? Is Ministry of Transportation and Communication wasting the taxpayers' money for poor IT? Has Ministry of Finance been successful in reorganizing their IT management? We argue that these numbers tell us nothing. We know Ministry of Education has had constant TCO. Yet their activities have not changed much – or they might have but we do not know it as it is not reported in the annual ICT reviews. Meanwhile Ministry of Transportation and Communication might have got new tasks, new systems, or new responsibilities that have presumed new IT investments. Ministry of Finance, for ones part, first might have re-organized their IT, and then better utilized it for their tasks. Basically, for each and every ministry, we do not know whether new systems have been acquired, or whether new systems are operating as intended.

Consequently the graphs and TCO's do not provide us an adequate basis for reasoning that one ministry is doing their IT management and investments better or

worse than the others. Every ministry provides different services for citizens, companies, its employees, other ministries, or other actors. They have different organizations, objectives, volumes, cultures, and resources thus arguments and comparisons between the ministries and their TCOs are misleading and provide incorrect results for sure. Yet they are presented and compared in official ICT reviews that are used as a basis for decision making in different institutions.

4   Purchaser-Provider Split

The purchaser-provider split model (illustrated in Figure 2) has been approved in public sector in Sweden [13] and in Finland. The model aims at rationalizing public service production by allowing external companies to compete with the departments of a municipality or a ministry in service production. For example, a municipality opens up their IT management services to external competition, potentially including an external company owned by the municipality itself. After bidding, an agreement is created with a company winning the bid. The municipality then stipulates the company to obey a service level agreement, where, e.g. the prices are explicitly defined. Then each department, such as hospitals or schools, may purchase their services according to their needs, following predefined agreement and prices. The municipality (purchaser) monitors the provider for adequate services, service level, and that they follow the agreement. The purchaser also instructs the customers to purchase their services from that particular service provider. The fundamental idea is to lower public administration costs as each department (customer) purchases only the services they need, with the prices that are transparent to the customers.
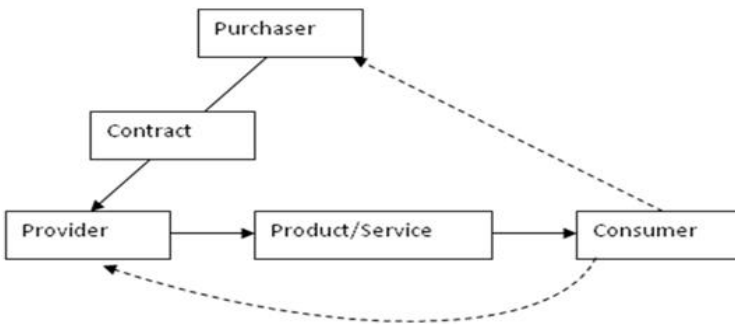

Fig. 2. Purchaser-producer split model

The transparency of the prices creates problems for sophisticated services, such as IT management or maintenance services. The price should cover all the costs – just like in every business. This means that TCO of each service should be calculated. However, as demonstrated earlier with the ministries, the context, spread and spectrum of IT services make it very difficult to compare them even within one provider. Similarly to ministries, also municipalities have different services for their employees, citizens and companies. Hence, IT costs should be evaluated according to the role of IT in specific service production.

The challenge of providing reasonable metrics for IT investments is illustrated in Figure 3, which is a fictive case of three services A, B and C. Service A could be, for instance, an access to ERP services, production costing 1000€[2], while service B includes an administration of database servers, production costing 100€ + 10€ for each server. Service C is workstation maintenance, production costing 1000€ + 1€ for each workstation. Three consumers want to utilize these services for their operations. Consumer I wants an ERP (service A), 10 servers (service B), and 10 workstations (service C). Consumer II wants an ERP, 2 servers and 100 workstations, and Consumer III just the maintenance of 1000 workstations. This means that an ERP with two accesses points, 12 servers, and the maintenance of 1110 workstations need to be provided. This necessitates resources worth for 3330€ (A=1000€ + 0€*2, B=100€+10€*12, C=1000€+1€*1110). Let us assume that the pricing structure is based on the number of workstations as such figure provides an easy way to monitor and charge for the service usage. Consequently the provider needs to charge for each service unit at least 3330€ / 1110 workstations = 3€/workstation. This means that Consumer I pays 30€, Consumer II pays 300€ and Consumer III pays 3000€.
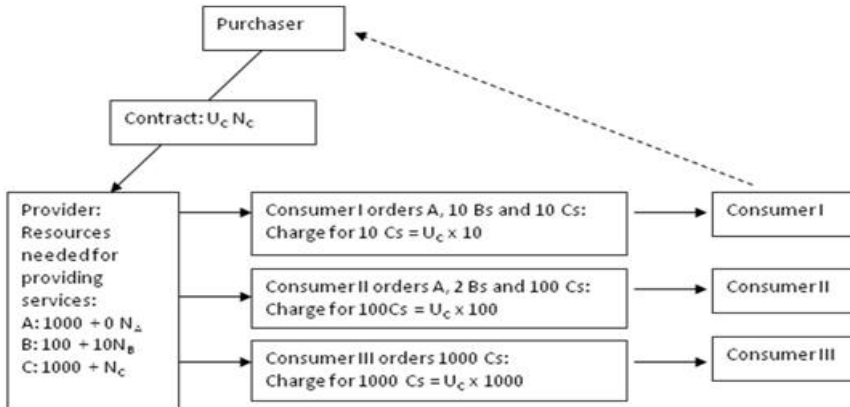

Fig. 3. Example of 3 services, A, B and C and Consumer I, II and III

It can be easily deduced that the provider is unable to optimize its service levels and costs for every service and customer. The inappropriateness of TCO measure for service pricing becomes apparent when we scrutinize the case from Customer III's point of view. Customer III only consumes service C (workstation maintenance), paying 3000€ for it. For the provider the same service costs 1000€ + (N_C=1000€) = 2000€. Thus, Customer III supplements the costs of other services which it does not utilize. Customer III could possibly find another less expensive provider for service C. As the principle of purchaser-producer model is to make the pricing transparent, Customer III should, in fact, try to change the provider.

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[2] Services, sums and cost models are fictious, not based on any study or data. They are chosen just to illustrate our argument. Also, for simplicity, we have excluded all other costs that are common for A, B, and C (e.g. common management, offices, etc).

If this change-over takes place, the basis for the provider changes (Figure 4). Now the provider needs resources for $2*A + 12*B + 110*C$ making it to cost 2330€, with a cost of 2330€ / 110 = 21,18€ per workstation. Thus, Consumer I pays 218€, II pays 2118€ and III pays, to a new service provider, let say 2500€, totaling 4836€. This makes sense to Consumer III who saves 500€. However, from the systemic point of view, costs increase 4836€ – 3330€ = 1506€ for the purchaser, the owner of Consumers I, II and III.
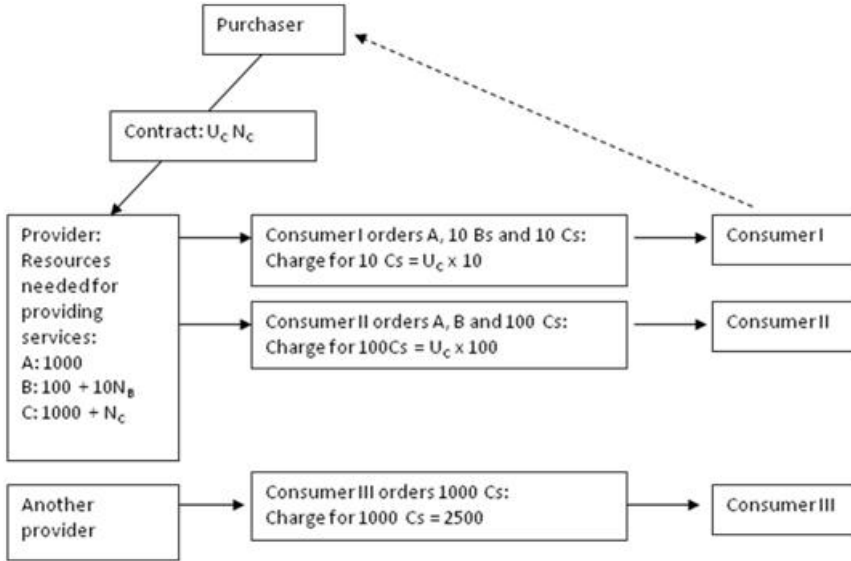

Fig. 4. Situation after Consumer III has changed the provider

What does this mean from the TCO perspective? Easily one may price oneself out from the market by incorrectly pricing their services – all services, including the costs of service A and service B. How to do it correctly? How can the costs be disentangled from one or another? Following the arguments of Lucas [26], Brynjolfsson [27] and Reichman and Staten [28] it cannot be done. This means that the provider has to include "extra" services and the development of new services and their costs to the pricing structure. Under the circumstances, the costs of a service are not based on its actual costs, but include the costs of other services.

5   Discussion, Implications, and Conclusions

The analysis of the ministries' IT budgets shows that an accurate comparison of the costs to others in different context is impossible even if we precisely know how the costs are composed. The analysis of the purchaser-producer split shows that TCO-based pricing will not provide an optimal situation for all consumers. As a matter of fact, purchaser-provider split and coarse TCO calculations make it possible to shift costs from one service to another, consequently sweeping possibly conflicting interests

under the carpet. Yet, as the pricing (of IT services) should be transparent, the price should reflect the real expenses, not hidden or estimated ones. This implies that either the service providers need to specialize to some narrow area, which would correspondingly increase the number of service providers, or the basis for pricing needs to be changed. Yet changing the pricing structure is difficult as purchaser-provider split is based on an assumption of charging actual, transparent costs. To be able to do it, calculating the total costs of a service is needed.

The analysis also questions the utilizations of private sector models for public sector (also in [34]). As Caudle et al. [35] show, public sector differs fundamentally from private companies by environmental factors (e.g. less market information, more legal and formal constrains), by organization/environment transactions (e.g. sanctions and powers of government, "public interest"), and by internal structures and processes (e.g. less delegation, no ultimate authority, more politics). Although currently internal structures and processes have been tried to be changed – as the popularity of purchaser-provider split shows – many characteristics of environmental factors, organization/environment transactions, and internal structures have been left intact. In order to properly apply the models, fundamental changes needs to be done throughout the system. To apply the purchaser-producer split model properly, there needs to be enough competition and freedom for consumers to select their preferable services. This necessitates experienced and professional procurement in public sector.

We have analyzed two different examples of utilizing TCO as a basis for comparing "the quality of IT management" or for arguing the basis for service prices. As we have shown, in both cases the use of TCO has resulted invaluable, incorrect, or expensive results. This implies that cost-based reasoning should not be used in public sector – or elsewhere. However, unfortunately cost-based reasoning is often used as a decision criterion as quality-factors (efficacy and efficiency) are much more difficult to quantify and compare. This sets a need for developing new, reliable, quantifiable, comparable, and real metrics for arguing both for IT investments and of their costs, and reasoning for the prices of different services.

Thus, our contribution to practice is to warn the practitioners of not using TCO for comparative purposes. The results will be incorrect for sure. Only if the basis of TCO calculation and the context are known in-depth, it can be used, for instance, to compare the shifts of costs between different years within one institution, municipality, or ministry. Our contribution to research is to urge for the development of more reliable metrics for comparing different institutions and their cost structures, and for arguing for the correctness of certain pricing principles. Currently we do not have such tools. If we cannot develop them, we should stop talking about TCO and costs as they do not form reliable data. Wittgenstein's famous words "What we cannot speak about we must pass over in silence" should be remembered.

References

1. Päivärinta, T., Dertz, W.: Pre-determinants of Implementing IT Benefits Management in Norwegian Municipalities: Cultivate the Context. In: Wimmer, M.A., Scholl, H.J., Ferro, E. (eds.) EGOV 2008. LNCS, vol. 5184, pp. 111–123. Springer, Heidelberg (2008)

2. VM 2007, Tietoja valtion tietohallinnosta ja tietotekniikasta (Finnish government ICT review 2006), Valtionvarainministeriön julkaisuja 5a/2007 (2007),
   `http://www.vm.fi/vm/fi/04_julkaisut_ja_asiakirjat/`
   `01_julkaisut/04_hallinnon_kehittaminen/20071004Tietoj/name.jsp`
3. VM 2008, Tietoja valtion tietohallinnosta ja tietotekniikasta (Finnish government ICT review 2007), Valtionvarainministeriön julkaisuja 26/2008 (2008),
   `http://www.vm.fi/vm/fi/04_julkaisut_ja_asiakirjat/`
   `01_julkaisut/04_hallinnon_kehittaminen/20080618Tietoj/name.jsp`
4. VM 2009, Tietoja valtion tietohallinnosta ja tietotekniikasta (Finnish government ICT review 2008), Valtionvarainministeriön julkaisuja 25a/2009 (2009),
   `http://www.vm.fi/vm/fi/04_julkaisut_ja_asiakirjat/`
   `01_julkaisut/04_hallinnon_kehittaminen/20090612Tietoj/name.jsp`
5. David, J.S., Schuff, D., St. Louis, R.: Managing your IT total cost of ownership. Communications of the ACM 45(1), 101–106 (2002)
6. Cappucio, D., Keyworth, B., Kirwin, W.: Total Cost of Ownership: The Impact of System Management Tools. Gartner Group, Stanford (1996)
7. Willcocks, L., Lester, S.: How do organizations evaluate and control information systems investments? Recent UK survey evidence. In: Avison, D.E., Kendall, J.E., DeGross, J.I. (eds.) Proceedings of the IFIP WG8.2 Working Group Information Systems Development: Human, Social, and Organizational Aspects, Noordwijkerhout, The Netherlands, pp. 15–39 (1993)
8. Frisk, E., Plantén, A.: IT investment evaluation – a survey on perceptions among managers in Sweden. In: Proceedings of 11th European Conference on Information Systems Evaluation (2004)
9. Lin, C., Pervan, G.: The Practice of IS/IT Benefits Management in Large Australian Organizations. Information Management 41(1), 13–24 (2003)
10. Ward, J., Daniel, E.: Benefits Management: Delivering Value from IS and IT Investments. Wiley, Chichester (2006)
11. Bennington, P., Baccarini, D.: Project Benefits Management in IT Projects – an Australian Perspective. Project Management Journal 35(1), 20–30 (2004)
12. Ashurst, C., Doherty, N., Peppard, J.: Improving the impact of IT development projects: the benefits realization capability model. EJIS 17(4), 352–370 (2008)
13. Siverbo, S.: The Purchaser-Provider Split in Principle and Practice: Experiences from Sweden. Financial Accountability & Management 20(4), 401–420 (2004)
14. Ellram, L.M.: Total cost of ownership: an analysis approach for purchasing. International Journal of Physical Distribution & Logistics Management 25(8) (1995)
15. Degraeve, Z., Labro, E., Roodhooft, F.: Total Cost of Ownership Purchasing of a Service: The Case of Airline Selection at Alcatel Bell. European Journal of Operational Research 156(1), 23–40 (2004)
16. Wilmering, T.J., Ramesh, A.V.: Assessing the Impact of Health Management Approaches on System Total Cost of Ownership. In: Proceedings of the IEEE Aerospace Conference, Big Sky, MT (2005)
17. Irani, Z., Ghoneim, A., Love, P.E.D.: Evaluating Cost Taxonomies for Information Systems Management. European Journal of Operational Research 173(3), 1103–1122 (2006)
18. Rosemann, M., Wiese, J.: Measuring the Performance of ERP Software: A Balanced Scorecard Approach. In: 10th Australasian Conference on Information Systems, Wellington, New Zealand (1999)
19. Millen, D.R., Fontaine, M.A., Muller, M.J.: Understanding the Benefit and Costs of Communities of Practice. Communications of the ACM 45(4), 69–73 (2002)

20. Taudes, A., Feurstein, M., Mild, A.: Options Analysis of Software Platform Decisions: A Case Study. MIS Quarterly 24(2), 227–243 (2000)
21. Bennett, C., Timbrell, G.: Application Service Providers: Will they Succeed? Information Systems Frontiers 2(2), 195–211 (2000)
22. Lönnqvist, A., Pirttimäki, V.: The Measurement of Business Intelligence. Information Systems Management 23(1), 32–40 (2006)
23. Blum, R.: Network and Systems Management Total Cost of Ownership. Lucent Technologies, Murray Hill, NJ (2001)
24. Lei, K., Rawles, P.: Strategic Decisions On Technology Selections for Facilitating A Network/Systems Laboratory Using Real Options & Total Cost of Ownership Theories. In: Conference on Information Technology Education archive: Proceedings of the 4th conference on information technology curriculum on Information technology education, ACM Press, New York (2003)
25. Dryden, P.: 'Futz factor' measurement tough to pin down in TCO. Computerworld (April 13, 2003),
    `http://www.computerworld.com/cwi/story/`
    `0,1199,NAV47_STO30535,00.html`
26. Lucas, H.: The Management of Information Technology: Strategic Decision Making for Managers. Wiley & Sons, Chichester (2004)
27. Brynjolfsson, E.: The Productivity Paradox of Information Technology. CACM 36(12), 66–77 (1993)
28. Reichman, A., Staten, J.: TCO is overrated. Forrester Research (2008),
    `http://www.forrester.com/Research/Document/Excerpt/`
    `0,7211,44545,00.html`
29. Moe, C.E.: E-procurement, determinants towards adoption. In: DEXA EGov Conference, Zaragoza, September 2004, pp. 3–6 (2004)
30. Moe, C.E., Risvand, A.C., Sein, M.K.: Limits of Public Procurement: Information Systems Acquisitions. In: DEXA EGOV Conference, Krakow, Poland (2006)
31. Moe, C.E., Päivärinta, T.: Procurement Of IS in the Public Sector – A Preliminary Study. Paper Presented in Scandinavian Workshop on E-Government SWEG 2010. Örebro, Sweden (2010)
32. Yildiz, M.: E-government research: Reviewing the literature, limitations, and ways forward. Government Information Quarterly 24(3), 646–665 (2007)
33. Gupta, M.P., Jana, D.: E-government evaluation: a framework and case study. Government Information Quarterly 20(4), 365–387 (2003)
34. Henriksen, H.Z.: The beauty and the beast: IT in government. Paper Presented in Scandinavian Workshop on E-Government SWEG 2010. Örebro, Sweden (2010)
35. Caudle, S.L., Gorr, W.L., Newcomer, K.E.: Key information systems for the public sector. MIS Quarterly 15(2), 171–188 (1991)