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UNMET PUBLIC EXPECTATIONS, PAY IT NOW OR PAY IT LATER

- LESSONS LEARNED FROM THE COLORADO BENEFITS MANAGEMENT SYSTEM (CBMS)

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Abstract

When a government entity outsources IT projects, consideration must be given early in the project to potential disputes and/or litigation with other parties, particularly third-party vendors, the public-at-large, and other parts of the supply chain. In this case, the State contracted for the Colorado Benefits Management System (CBMS) and the counties throughout the state were expected to deliver client services using the new system. The public expected transparency of government reporting while the State focused on accountability measures of the CBMS project. We use Agency Theory to help explain why certain public expectations were not initially met by CBMS and how some of these "disconnects" could have been avoided. Since the State, IT vendors, the public, and counties have different goals, risk preferences, and information needs, they used different measures to evaluate any government IT project. These mismatched measurements help explain the cause of any unmet expectations that can lead to disputes and/or litigation. We found that the State and IT vendors evaluated this IT project using more process-based accountability measures while the public and counties evaluated the project more with outcome-based measures. Therefore, we recommend that the State and IT vendors should emphasize both outcome-based and process-based measures in order to be more transparent when designing and implementing IT projects. The Colorado Benefits Management System (CBMS) provides an interesting case study showing how Agency Theory can be applied to a governmental IT project and how different measurements used by the State, IT vendors, the public, and counties contributed to the tension and turmoil experienced while implementing CBMS.

Keywords: Government IT projects, IT project failure, IT outsourcing failure, process-based measures, outcome-based measures, accountability, transparency, Colorado

1. Introduction

CBMS provides valuable lessons about why conflicts might occur while designing and implementing a government IT project, and how such conflicts might be mitigated. Although some government IT projects are not delivered on time, or on budget, most are eventually implemented and used successfully. Notwithstanding these eventual operational successes, the projects may still be considered as failed projects by citizens, the media, or the courts. Citizens, the media, or the courts expect that IT projects will be completed on time and within budget and achieve a certain level of performance. However, most IT projects take more time and more money than expected and do not immediately reach the expected requirements. Thus, the public quickly concludes that the project has failed and complains about the system. In the meantime, the government and developers do not think that the project is a failure since they have different expectations about the system. When evaluating IT systems, the evaluators may focus on process-based accountability measures and not enough on outcomes. From their perspective, the IT project has not failed, but is only in temporary trouble. However, a government IT project is unlike a corporate project that answers only to senior managers and Directors. Government IT projects have a "public face" that, without transparency, may lead to highly visible complaints or class-action lawsuits if the system is not working properly and produces bad results. In this case, the government needs correct and appropriate measurements to justify the system design and implementation. If government IT designers do not have the appropriate measurements, they will have a hard time defending their troubled system. In order to be accountable, the government agencies and vendors must use measures that reflect public expectation.

On an overall basis, the US spends more than $250B annually on approximately 175,000 corporate and governmental IT projects [Standish Group 1995, p. 1]. Only 16.2% of IT projects were completed on-time and on-budget; many failed. Among completed projects, only 42% met the original specifications for project features and functions. In total, 78.4% of IT projects met 74.2% of original features and functions. In 1995, the US spent $81B for cancelled IT projects and paid an additional $59B over the original budgets for those projects [Standish Group 1995, p. 2].

A later report reported somewhat better statistics than those in 1995, but still demonstrated low success rates and huge spending on failed systems [Standish Group, 2005]. For 13,522 IT projects completed in 2002, 34% were considered successful, 51% were challenged, and 15% were considered failures. While the success rate almost doubled to 34%, it is still not very high. Almost $38B was spent for failed IT projects, and an additional $17B was spent on cost overruns (vs. $255B for all IT projects). Overall, IT project costs were almost the same as in 1995 and money spent on failed projects decreased significantly, but losses are still staggering.

Government IT projects demonstrated the same troubling trends. In 2003, the Internal Revenue Service (IRS) had a failed $8B IT project that was 40% over budget [Johnston, 2003]. In 2005, the FBI had developed the Virtual Case File system to help track terrorists, spending $170M over more than three years [Keizer 2006; Verton 2004]. During the last two decades, Colorado also experienced serious IT project failures, e.g., the Airport Baggage Handling System (DIA), and the Department of Motor Vehicles (DMV) system. Both IT projects cost a lot of money and did not work as required. Both DIA and the DMV reverted to using much of the old system.

CBMS is a unified benefits management system that replaced six legacy systems to determine client eligibility and pay appropriate benefits. The project was not

successful at the outset. It was not completed on schedule or on-budget. CBMS did not work well, causing problems for recipients who did not receive their benefits or who received them much later than under legacy systems. Disgruntled citizens participated in a class-action suit to try to overturn CBMS and restore the legacy systems. CBMS became a public issue for the legislature and the media. Although CBMS did not ultimately fail and only had some implementation delays, the public believed that it was a failure. We found that traditional system development metrics and procedures are different from the criteria and success factors held by the public, the media, stakeholders, and courts. The measurement mismatch, or incorrect measures, or lack of transparency, escalated the problems to serious public concerns that tarnished the image and public acceptance of CBMS.

In order to extend the lessons learned from CBMS, we reviewed Agency Theory and the relevant literature about measurement problems. Agency Theory can be applied when two or more parties have different interests that conflict with each other. We applied Agency Theory to the CBMS case to identify agency relationships among different parties and discussed agency issues in these relationships. We then examined the measurements used by the State and the vendor (Electronic Data Systems, EDS), the public, and counties based on public documents. Since all parties have different goals and risk preferences, we evaluated the different measures used by each. Lastly, we recommend measures that state governments could use when developing such IT systems in order to be more transparent.

2. Review of CBMS

CBMS is a unified system jointly developed by the Department of Human Services (DHS) and the Department of Health Care Policy and Financing (HCPF) to replace six existing legacy systems:

- Colorado Adult Protection System (CAPS),
- Colorado Automated Client Tracking Information System (CACTIS),
- Colorado Automated Food Assistance System (CAFSS),
- Children's Basic Health Plan Plus (CHP+),
- Client Oriented Information Network (COIN), and
- Colorado Employment First System (CEF)[1].

Although the existing legacy systems were accumulating data, determining eligibility, and processing payments, they were hard to modify and costly to maintain since they were based on obsolete and unsupported programming languages. Eligibility determinations were inconsistent because decisions made at the county-level were subjective and often in conflict with policy manuals and rules. Multiple data entries were required under each legacy system.

Three major reasons were used to justify CBMS:

- CBMS will improve access to public assistance and medical benefits by providing one-stop shopping for clients, permitting faster eligibility determinations, and allowing for higher accuracy and consistency in eligibility determinations state-wide.

[1] CBMS Fact Sheet 2004, p.1

- CBMS will replace antiquated, inflexible legacy systems that use outdated programming languages, are difficult to modify, and continue redundant processing in individual "stovepipe" systems.

- CBMS will increase efficiencies by allowing for:
    - Universal cross-trained workers, rather than specialized workers (who only deal with one program);
    - Rules driven eligibility determination, rather than looking through manuals; and
    - Single data entry for multiple assistance programs. [2]

The scope of CBMS was specified as:

- CBMS focuses on the consolidation and elimination of existing systems for the streamlined determination of eligibility in the counties and in non-county facilities, such as hospitals, clinics, and schools, where medical applications are filed.

- The CBMS project represents a new kind of partnership between the State of Colorado and counties. "We're dealing with an unprecedented level of cooperation," said Bob Teklits, CIO for IT Systems in DHS. "In order for CBMS to work, all of us have to be flexible. It's a matter of give and take."

- Because many counties require different levels of control, special arrangements are being made to accommodate individual county needs. Teklits explained that in cases where counties request special options within their own LANs, they will be responsible for maintaining and supporting those facilities. [3]

The need for CBMS as a legacy replacement project was first realized in 1989 but funds were not approved by the Colorado General Assembly (CGA) and federal agencies until 1995. In 1999, funds were actually allocated to CBMS. The government decided to outsource CBMS because of anticipated Y2K problems. In 1999, two proposals from EDS and IBM were received, but at higher prices than authorized by the Joint Budget Committee (JBC). The State asked for re-bids, and EDS was awarded the contract at $91,699,458. While the initial contract with EDS was signed in 2000,[4] the project was quickly behind schedule (3 months in 2001 and 9 months in 2002) and many system requirements were abandoned. The software toolkit (CalWIN) was changed because code from another EDS project in Arkansas did not work for CBMS. More funds were allocated by the JBC in 2002 ($16M). In 2004, Maximus was hired (at $4.4M) to conduct Independent Verification and Validation (IV&V) and two pilot tests were conducted. The results from the pilot testing were problematic, but CBMS was implemented over the county's objections in September, 2004 at a total cost of at least $200M.

[2] CBMS Fact Sheet 2004, p.1
[3] http://www.cdhs.state.co.us/text/oss/cbms/CBMSNEWS.html#Colorado%20Departments (Volume 1, Issue 1 June 1998) (Revised 04/01/03)
[4] CBMS Contract, p.16

Maximus conducted the IV&V and found that no milestones were specified for the project, responsibility for deliverables was not defined, and no performance criteria were specified [McCubbrey and Fukami 2005]. The Maximus report [2004] pinpointed major flaws in the state's vendor acquisition strategies, the initial CBMS baseline requirements, the vendor's technical understanding of the State's requirements, and the State's organizational structure for managing CBMS (processes, procedures, resources, organizational structure, interfaces, etc.).

Deloitte Consulting conducted a post-implementation review of CBMS in March, 2005 ($365K) with a focus on improving ("fixing") CBMS. This is not the traditional purpose of post-implementation reviews which are often used to identify lessons-learned and to avoid similar disasters in the future. Deloitte identified that CBMS provided incorrect eligibility determinations, clients received excessive, confusing, and/or conflicting notices, and users (staff) were frustrated and confused with the system. Benefits were routinely over-paid, and system interfaces did not work smoothly. Counties lacked useful reports and data, and the communication between the state, counties, and end users was ineffective. Users did not receive ongoing training and sufficient help-desk support. Technical and maintenance issues put quality and sustainability of the system at risk. They also indicated that no single person was accountable for CBMS, and that the two department heads (DHS & HCPF) who helped design CBMS lacked computer expertise.

A class action lawsuit began one day before CBMS was implemented (August 30, 2004). The Colorado Center on Law and Policy (CCLP) sued the State Directors of DHS and HCPF to delay implementing CBMS. Initially, plaintiffs requested that CBMS be shut down and revert to legacy systems until CBMS was improved. In December 2004, Denver District Judge John Coughlin denied this request and ordered the State to establish an emergency call center for benefits applicants and to process 30,000 benefit applications that had lagged beyond federal deadlines. District Judge Lawrence Manzanares later ordered the parties to attempt settlement mediation and focus on appropriate and accurate performance-based measures and standards. The plaintiffs wanted CBMS to achieve timely and accurate processing at more than 90% [McCubbrey and Fukami 2006]. They asked the State to implement a reliable reporting system or periodic independent audits to verify CBMS operations. The plaintiffs also wanted to assure that clients were receiving the benefits that they applied for and that the State compensated people who did not receive their benefits. In December, 2007, the CBMS lawsuit was settled and DHS was ordered to deliver services such as Medicaid and food stamps in a timely manner. During the 36-month review period, CBMS performance would be measured and monitored. DHS would deliver new food stamp benefits to eligible clients within 30 days after applications were filed. Families eligible for expedited food stamps would receive them within 7 days. Applications for CHP+ benefits would be processed within 45 days. Three times during the 36-month review period, HCPF would provide a random sample of cases for an independent auditor to review whether benefits were correctly determined. However, disagreements continued on the percentage of cases timely processed and when to consider CBMS as a failure [Ensslin 2007].

3. Agency Theory

Before applying Agency Theory to the CBMS case, we briefly review Agency Theory. Agency Theory has been used by researchers to explain the relationships between parties in IT project management and IT outsourcing vendors. Agency relationships occur in which one party (principal) determines the work and another

party (agent) undertakes the work [Eisenhardt 1985]. A firm hires an IT supplier and delegates (outsources) IT development to her. Since each party has different roles in an agency relationship, goals and risk preferences may be conflicted. In this relationship, the principal pursues its own benefits by forcing the agent to work hard and achieve better performance. The principal prefers taking risks because it can produce greater profits for the principal, especially under a fixed price contract. The agent pursues its own goals by maintaining a minimum level of effort and acceptable performance levels [Bieman 2005]. The agent does not prefer taking risks and does not like performance-based rewards [Nilakant and Rao 1994]. In addition to different goals and risk preferences, each party has different information. Because of this information asymmetry, it is difficult to verify what the agent is actually doing and it is expensive to motivate and coordinate the agent's decisions and behaviours [Sappington 1991].

Goal conflicts, diverse risk preferences, and asymmetric information cause three agency problems: moral hazard, adverse selection, and imperfect commitment [Aubert et al. 1996]. Since it is expensive to observe an agent's behaviours, the agent does not expend maximal effort [Eisenhardt 1989] and can blame poor performance on unforeseen circumstances. Moral hazards such as cheating, shirking, free-riding, cost padding, exploiting a partner, or simply being negligent can occur. When a principal chooses an agent, adverse selection can occur. Before contracting with the agent, the principal is not sure whether the agent accurately represents its ability. It is hard to identify the agent who will work hard on behalf of the principal. Lastly, imperfect commitment can occur in an agency relationship. The principal and the agent are tempted to cancel or change their contractual requirements, which results in costly contractual amendments and changing allegiances and commitments [Sappington 1991].

Agency problems drive agency costs such as the cost of writing and enforcing contractual agreements and similar management activities. Writing and enforcing contractual agreements is expensive because the principal wants the agent to do the required work, while the agent wants to expend a minimum level of effort. Since any change in a contractual agreement increases contracting costs, the initial contract should be written very carefully. Information asymmetry increases for projects that have high levels of uncertainty and complexity. Project management is difficult and expensive, and principals will try to reduce such management costs. Coordinating or motivating the agent is also difficult and may increase project management costs. However, the principal's experience and expertise can help reduce information asymmetry problems. The principal can also improve its monitoring abilities through experience and reduce its management costs [Sappington 1991].

In order to reduce agency problems and agency costs, it is important to design efficient contractual agreements [Eisenhardt 1989]. Under a fixed cost (wage) contract, the compensation is not reflected by the agent's work quality or effort, so the agent is likely to shirk [Eisenhardt 1985]. Performance-based compensation can reduce agency problems [Alchian and Demsetz 1972]. If the agent is compensated for its effort, the agent increases effort and performance. Providing ownership rights to the agent reduces the incentive for adverse selection and moral hazard [Jensen 1983]. In the absence of contractual agreements, the principal and agent can reduce agency costs by aligning objectives and reducing information asymmetry [Holmstrom 1979]. Greater monitoring produces greater project success [Might and Fischer 1985] and encourages agents to act in the interests of the principal [Tosi et al. 1997].

4. Measurement Problems

While disputes and litigation may occur when outsourcing, these undesirable events may be mitigated by using better measures [Alchian and Demsetz 1972; Barzel 1982]. Measurement problems occur when it is impossible to evaluate individual contributions to overall performance [Alchian and Demsetz 1972]. If an accurate measure is unavailable, buyers should better monitor the project, or suppliers should better signal cost data [Barzel 1982]. However, if the buyer has valid measures, it is easier to assess the contract and the cost of monitoring and signalling can be reduced. During disputes, performance measures can be used to validate success, justify additional resources, and earn public loyalty by reporting results [NAPA 1999, p.7]. Although performance-based measures provide a justification for the agency's existence, many agencies cannot defend their systems in performance-based terms [Boone 1996, p. 10]. Establishing performance targets for vendors and enhancing vendor performance through performance standards helps reduce disputes and litigation [Greer et al. 1999].

Traditionally, system performance has been measured in financial terms, but it now includes balanced scorecard financial measures along with customer and employee measures of service quality [Greer et al. 1999]. DeLone and McLean [pp. 62, 1992] categorized IT success in six areas: system quality, information quality, information use, users' satisfaction, individual impact, and organizational impact. Industry Commission of Australia (ICA) also suggested four approaches to measure performance of outsourced services: performance indicators, inspections, contractor reports, and client complaints and surveys [ICA 1996, p. 361]. Hudson et al. [2001] suggested six general dimensions in a strategically aligned performance measurement system: quality, time, flexibility, finance, customer satisfaction, and human resources.

Service Efforts and Accomplishments (SEA) reporting identifies performance measures for government projects. SEA reporting recommends measuring service efforts (input), service accomplishments (output and outcome), relationships between service efforts and service accomplishments (input-output and input-outcome), and external factors that influence results.[5] Texas and other states[6] have already adopted performance measures based on SEA reporting recommendations. Avery [2000] suggested establishing performance monitoring and feedback from users and service providers in outsourcing public health laboratory services. He recommended the development of written performance goals and the monitoring of external providers to ensure contract fulfillment.

Outcome-based contracts are usually easier to monitor [Parks and Conlon 1995], and they are more likely to be successful [Balkin, et al. 2000]. Employees have private goals that often conflict with the overall objectives of the firm [Baugh and Roberts 1994], which can lead to project failure [Harrell and Harrison 1994]. Since employees have self-interests, they do not work towards the firm's goals and they blame poor performance or project failure on circumstances beyond their control [Baiman 1982]. Employees may misrepresent privately-held information and this can lead to project failure [Eisenhardt 1989].

[5] http://www.seagov.org/aboutpmg/performance_measurement.shtml
[6] http://www.seagov.org/initiatives/state_gov.shtml

5. Analysis of CBMS

Based on the nature of the Colorado Benefit Management Systems (CBMS) it proved to be a perfect case study. The environment surrounding CBMS made available extensive documentation that was publicly available from the government, media, Internet and other resources (e.g. journals and court records). First we analyze the agency relationship among parties involved in CBMS and discuss important principal agency issues such as goals, risk preferences, and information asymmetry. After that, we will describe the measurements used by the county, media and courts to attack/defend CBMS.

5.1. Agency Relationship in CBMS

Four parties were involved in CBMS' agency relationship: the public (represented by citizens, the media, and courts), counties, the State, and EDS. Depending on each party's interests, goals and information access, the agency relationships were different. Under CBMS, the State was the principal and EDS was the agent. The State

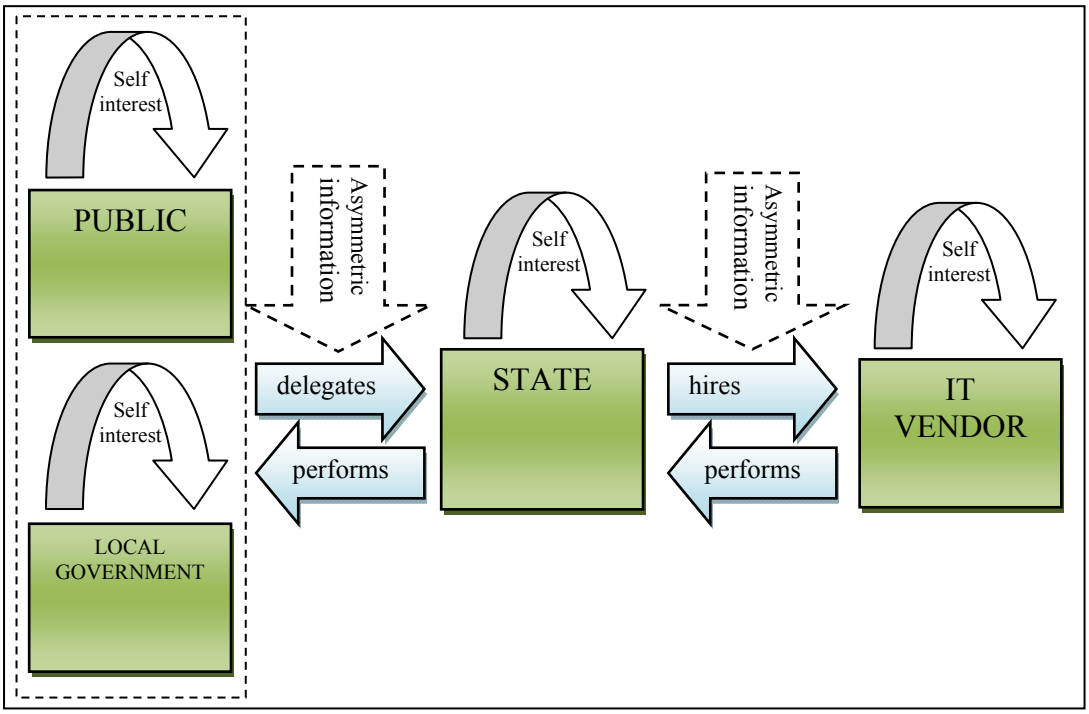

Figure 1. Agency Relationships in CBMS

hired EDS and contracted the responsibility to develop CBMS. The State did not have the ability to develop CBMS and also did not know whether EDS had the requisite capability. In the relationship between the public and the State, the public was the principal and the State was an agent. The public delegated their IT contracting responsibility to the State, since they did not have the ability to directly contract. However, explicit contracts do not exist between the public and the State. In the relationship between counties and the State, counties were principals and the State was an agent. Counties delegated the IT contracting role to the State and the State issued and monitored the contract on behalf of each county. Contracts do not exist between counties and the State either. Figure 1 shows the agency relationships among the four parties.

The State, EDS, the public, and counties had their own self-interests; EDS wanted to win the CBMS contract and reduce its design and implementation cost, while the State wanted to maximize the project effectiveness and outcomes with a minimum budget. In other words, the State tried to purchase a better system with a fixed budget. Therefore, The State and EDS reduced the system cost from the original $200M unsuccessful bids to $100M when the CBMS contract was signed. Meanwhile, the public, represented by citizens, the media, and courts, had significant interests in the performance of CBMS. System failure could directly harm the public, by either paying too few or too many benefits. The public wanted to maximize their benefits with minimum application processes and time. Counties also wanted to improve work performance with minimum operating efforts. Thus the concerns of the public and counties are represented by the CBMS outcome measures.

Because the State, EDS, the public, and counties had different goals and interests, they also had diverse risk preferences. As a quasi-public entity, the State should be risk-neutral and, as an IT provider, EDS should be risk averse. In a non-profit or government setting, the State and EDS could not share any productivity gains. EDS was limited by their performance contract and could not be rewarded for extra work not specified in the contract [Hancox and Hackney 2000], so EDS did not want to take risks. On the other hand, if the State wanted to produce a better system because the contract costs are fixed, they may prefer taking risks. The public and counties also wanted to take risks because they could obtain a better benefits system without spending more money.

Information held by the State, EDS, the public, and counties are asymmetrical; the State did not have sufficient information about EDS' IT development ability and could not be sure if EDS had expended maximal effort to develop CBMS. EDS was a hardware service company trying to enter the software service business. The public needed to apply for and receive benefits but they did not have the ability to issue IT contracts, so they delegated this responsibility to the State as taxpayers and by electing State representatives. Counties had the ability to operate the system but they did not have the ability to issue IT contracts and they delegated this responsibility to the State, but they did not know the State's or EDS' abilities. Therefore, the State, EDS, the public, and counties tend to evaluate the system based on their experiences and abilities. Table 1 summarizes the important components of Agency Theory in CBMS.

Table 1. Principal-Agency Issues in CBMS

	EDS	State	Counties	Public
Interest/Goals	• Win a contract • Minimize development cost • Minimize development effort	• Minimize budget • Maximize the project effectiveness and outcomes.	• Maximize work performance • Minimize operating efforts	• Maximize benefit • Minimize application processes and time
Risk Preferences	• Risk averse	• Risk taking	• Risk taking	• Risk taking
Information	• IT development abilities	• IT contract abilities	• Operating abilities	• Applying abilities

5.2. Measurement Problems in CBMS

Since there was a contract between the State and EDS, litigations/disputes between the State and EDS can be resolved based on their contract. However, the litigation/dispute between the State and the public is more complicated because there is only an implicit contract between the State and the public. Developing correct measurements is important in minimizing disputes. We identified the following performance measures that can be associated with CBMS: project specifications, project control, project estimation, project planning, contracting, system performance, and risk assessment from prior studies on outsourcing, project management, risk assessment, and de-escalation. We then reviewed public information on CBMS from articles, white papers, project reports, news and other media, State websites, and court records during 1998-2007. We added more measurements such as system testing, cost, customer satisfaction, service level agreement, efficiency, and caseload (Table 2). We linked each CBMS dimension to the performance measures and identified how these measures might be used by different parties. Table 2 summarizes the measurements used by the State and EDS to defend the system and the measures used by the public and the counties to criticize CBMS. The marks shown in Table 2 indicate the level of expectations of the State, EDS, the public, and counties about each measure. (√ indicates high expectations, × indicates medium expectations, and blank indicates no expectations.)

Table 2. Performance Measures used by the State & EDS, the Public, and Counties

	Performance Measures	State & EDS	Public	Counties
Process-based measures	Project Specifications	√		
	Project Control	√		
	Project Estimation	√	×	
	Project Planning	√	×	
	Contracts	√		
	System Testing	√		
Outcome-based Measures	System Performance	√		√
	Risk			
	Cost	√	×	√
	Customer Satisfaction		√	√
	Service Level Agreement	×	√	√
	Efficiency	×	√	√
	Caseload	×	√	√

The measures used by each party were different since they have different goals, diverse risk preferences, and asymmetrical information. Because the State and EDS were directly contracted to develop CBMS, they were interested in the development process as well as the outputs. So the measures used by the State and EDS were not only outcome-based but also process-based. The State and EDS were concerned about the outcome-based measures such as system performance, cost, service level agreement, efficiency, caseload, and the process-based measures such as project specifications, project control, project estimation, project planning, contracts, and system testing. In the Maximus and Deloitte reports, we identified process-based measures as well as outcome-based measures used by the State and EDS to evaluate CBMS. By examining media and court documents, we identified outcome-based measures used by the public and the counties. The public and counties were interested

in system operation and efficiencies and had more knowledge on using the system. The public evaluated CBMS using more outcome-based measures such as system performance, risk, cost, customer satisfaction, service level agreement, efficiency, and caseload. They also use some process-based measures such as project estimation, project planning, and system testing to attack CBMS. Counties assess CBMS only with outcome-based measures such as system performance, cost, customer satisfaction, and caseload because they are the final user of CBMS and more interested in the output of the system. In the following section, we provide supporting evidence on how each type of measure was used by different parties.

5.2.1. Project Specification

Project specifications can be measured by scope, size and complexity. The State and EDS were concerned about project specification when evaluating CBMS. The public and counties were not concerned about the details of the project. Payment systems usually have low complexity, so risks are low. However the size of CBMS, unlike other payment systems, was huge. The overall complexity and risks of CBMS were high and traditional project management models were utilized to develop CBMS. These specifications were well-documented in the CBMS Fact Sheet in 2004 [7] and CBMS News on the CDHS website during the period 1998-2003. [8]

5.2.2. Project Control

Project control is measured by monitoring, detection, change (correction), metrics, accountability, and quality assurance. The State and EDS were concerned about various project controls and contractual agreements because they were directly related to CBMS development, but the public and counties were not concerned about project control. Government documents showed how project control was used to evaluate CBMS. In general, there were multiple and overlapping responsibilities under CBMS:

- Joint Application Design (JAD) helped identify information gathered early in the project (feasibility and conceptual design) to ensure that CBMS met the needs of its potential users.

- Monitoring agencies were also identified in CBMS News:
    - Steering Committee – Members (State and county managers) make recommendations to the Oversight Committee.
    - Oversight Committee –Executives from the State and counties can approve (or modify) each deliverable.
    - Commission on Information Management (IMC) – The IMC studied key deliverables to determine if they reflected an appropriate direction.[9]

5.2.3. Project Estimation

Project estimation is measured by scheduled activities and project budgets. The State, EDS, and the public were interested in project estimation to attack/defend CBMS. Schedule activities were monitored by the State and EDS, while project budgets were

[7] CBMS Fact Sheet 2004
[8] http://www.cdhs.state.co.us/text/oss/cbms/CBMSNEWS.html#Colorado%20Departments (Volume 1, Issue 1 June 1998) (Revised 04/01/03)
[9] http://www.cdhs.state.co.us/text/oss/cbms/CBMSNEWS.html#Colorado%20Departments

monitored by the State, EDS, and the public. CBMS schedule activities were frequently updated on the CBMS websites:

- Detailed design was scheduled to be completed by July, 1998.
- Proposal for federal matching funds (IAPD) and a Request for Proposal (RFP) for an implementation contractor were due by early August, 1998.
- The system was scheduled to be in development by April, 1999. [10]

The CBMS website provided budget estimates in 1999:

- The total development cost of the CBMS was estimated at $51.6 million, which would be financed entirely with State and federal funds. Once implemented, the annual cost of operating the CBMS was estimated at $20 million while annual benefits were projected at an estimated $30 million. This annual net savings of $10 million for the system would result in payback of planning/development costs in approximately 5.5 years. [11]

By 2004, the CBMS budget had escalated and it was criticized by the public:

- The original baseline cost estimate for the CBMS project was $193.9 million. In addition, $958,000 for a Risk Premium and $4.4 million for Independent Verification & Validation (IV&V) expenses were added to the original baseline cost estimate for a total estimated project cost of $199.3 million. CBMS received additional funding, which did not increase the baseline cost estimate. [12]

5.2.4. Project Planning

The State and EDS were more concerned about project planning while the counties were less concerned and not involved in project planning. In order to replace six legacy systems, CBMS project planning is evaluated by milestones, specific deliverables, scope, staffing, risk, training, shared understanding, resource availability, and capacity planning. Milestones and scheduled completion dates are used to defend CBMS by the State and EDS and to attack CBMS by the public since the completion of CBMS was delayed. The scheduled completion dates are shown in Appendix 1. In 2002, the CBMS project milestones were listed on the CBMS website (Appendix 2). The State and EDS were concerned about the specific CBMS deliverables:

> *A series of checks and balances is built into the CBMS development process. Each task involves a deliverable, and each deliverable must be approved at two levels. Additionally, Deliverables 4, 5, and 6 must be approved by a third level.* [13]

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[10] http://www.cdhs.state.co.us/text/oss/cbms/CBMSNEWS.html#Colorado%20Departments (Volume 1, Issue 1 June 1998) (Revised 04/01/03)
[11] http://www.cdhs.state.co.us/text/oss/CBMS/CBMSPAGE.html
[12] CBMS Fact Sheet 2004, p. 1
[13] http://www.cdhs.state.co.us/text/oss/cbms/CBMSNEWS.html#Colorado%20Departments (Volume 1, Issue 1 June 1998) (Revised 04/01/03)

The deliverables were specified in the EDS contract:

> *The State must review the final deliverable (document, product, or service) within 15 working days of receipt (for iteration deliverables within five working days of receipt). Also the State and the Contractor, working together during the first three months of the project, shall mutually agree which tasks can continue being worked while the state approval on earlier deliverables is pending.*[14]

Staffing plans for the design phase and the implementation phase included:

- The project expects increased county participation – on a variety of levels.
- Several fulltime positions were available in 1998 and 1999. [15]

CBMS training needs were identified in Contingency Plan:

- The Contingency Plan reported that personnel will be trained to implement manual contingency processes. An effective cross-training program was supposed to be provided to conduct vital functions when key personnel were not available.
- The contract required the contractor to provide training under an approved training plan. [16]

5.2.5. Contracts

The State and EDS were concerned about the contracts, but the public and counties had no concern about the contract terms. The EDS contract specified a fixed-price, but that was questionable since CBMS involved many add-ons. CBMS requirements were quite ambiguous and changed rapidly. Under a fixed price contract, there is little or no motivation for the contractors to complete additional work.

5.2.6. System Testing

Only the State and EDS were concerned about system testing. Numerous types of system testing were identified in the Maximus report: unit testing – development, component testing, verification testing, system integration testing, joint interface testing, unit testing – decision tables, program area testing – decision tables, user acceptance testing, regression testing, system performance testing [Maximus 2004]. The details of each testing are shown in Appendix 3. System testing results that were criticized in media documents include:

- No usability testing was performed.
- Little stress testing was conducted, and functional testing was inadequate.

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[14] Contract p.14-15
[15] http://www.cdhs.state.co.us/text/oss/cbms/CBMSNEWS.html#Colorado%20Departments (Volume 1, Issue 1 June 1998) (Revised 04/01/03)
[16] Contingency Plan 2004, p.3

- Design errors required seventeen different screens to process one case.

- System interfaces didn't work smoothly.

5.2.7. System Performance

The State, EDS, and the counties were interested in CBMS performance measures. Since counties are users of CBMS, performance measures used by counties were clear and vivid. System performance was measured by service availability and timeliness, out-of-hours availability, emergency response, within budget, delivery to expected quality standards, troubleshooting, and correct error fixes. System performance was identified in government, media, and court documents as follows:

- Application processing time was 15 minutes prior to CBMS implementation, but 2 hours after CBMS was first implemented.

- Initially the system only worked 63% of the time, with an error rate of 37%.

- Complicated data-entry requirements

- Delayed benefits to qualified recipients.

- Counties lacked useful reports and data on application filing and processing.

- No emergency plan was created.

5.2.8. Risk

Risk is measured by assessment, model, and contingency plan. No parties were interested in CBMS risk assessments. According to the documents available to researchers, it is clear that risk assessments were not conducted early in CBMS project planning. Different architectural scenarios were superficially assessed. At the beginning of CBMS, risk factors were identified by Maximus but were not implemented. The manner in which the CBMS project was managed suggests the State and EDS were willing to accept a high-level of risk by reducing the system cost from $200M to $100M. Risk was identified by the following actions:

- Forced the implementation date

- No contingency plan.

- Direct cut-over from legacy systems to CBMS, no phased conversion

- Early contract changes since intended reuse of system code, as a cost cutting measure, was not feasible

5.2.9. *Cost*

All constituents considered CBMS costs and benefits as shown in various documents and the CBMS website. The State, and EDS were quite concerned about costs while the counties and public were less concerned about costs. CBMS costs escalated over the design and implementation phases. The benefits were overstated and inconsistent with the costs. State documents claimed CBMS would:

- Streamline and simplify application and eligibility processes.
- Maximize access to public assistance and medical benefits.
- Reduce time for processing client eligibility.
- Allow for easier, quicker, and less complicated case transfer.
- Integrate notices of CBMS actions from multiple programs.
- Permit more consistent eligibility determinations, based on most current State and county rules and regulations.[17]

5.2.10. *Customer Satisfaction*

The public and counties were concerned about customer satisfaction since counties were required to use CBMS to deliver services to the service recipients (public), however the State and EDS were not concerned about customer satisfaction. Government and media documents showed the following concerns about low customer satisfaction by the public and counties:

- Ineffective client service (delays in benefit processing).
- County staff and clients were frustrated and confused by difficult operation, slow response times, and incorrect benefits decisions.

5.2.11. *Service Level Agreement*

The public and counties were more concerned about the service level agreement (SLA) but the State and EDA were not concerned about the service level agreement. The public, as parties to a lawsuit, later negotiated the following strict service level agreements as reported under the court's settlement:

- 45 days maximum for most Medicaid and CHP+ applications.
- Reduce the number of cases exceeding timely processing limits.
- Create an emergency processing unit with an adequately staffed "800 number" to handle cases exceeding timely processing limits. [18]

[17] CBMS Fact Sheet 2004
[18] httP://www.cclonline.org/welfare/lit.htm, 2005

The final CBMS service level agreements included:

> *In December 19, 2007, the CBMS lawsuit was settled as the State agreed to the above SLA deadlines to process applications in a timely manner. The settlement created a 36-month period during which CBMS performance would be measured and monitored. Three times during the 36 month review period, HCPF was required to provide a random sample of cases so an independent auditor can review whether or not benefits were correctly approved or denied* [Ensslin 2007].

5.2.12. Efficiency

The public and counties were most concerned about CBMS' efficiency, however the State and EDS were less concerned about its' efficiency. As shown in media documents:

- Inaccurate benefits were provided to 596,000 Colorado clients.
- CBMS was implemented before achieving accuracy rates of 98%.
- Incorrectly updated food stamp benefits for tens of thousands of clients.
- At the time of conversion, 75% of the cases were at risk of interruption or closure.
- 50-60% of all help desk tickets were created by counties (user errors).

5.2.13. Caseload

The public and counties considered caseload a critical issue. However the State and EDS were less concerned about caseload measures. High case loads were identified in many government documents as follows:

- Tremendous workload on staff to convert over 80,000 cases from legacy system to new system.
- In September 2004, news media reported "9,000 backlogged food-stamp applications in five metro-Denver counties and 16,000 backlogged requests for family medical assistance and Temporary Assistance to Needy Families" [Scanlon 2004].
- Subsequently, application backlogs increased in 2005. [19]

The monthly backlog of active help desk tickets was reported on the CBMS website. After CMBS was implemented, the monthly backlog of active help desk tickets dramatically increased for almost a year, after which it decreased and stabilized (see Figure 2).

[19] CBMS Update 2007

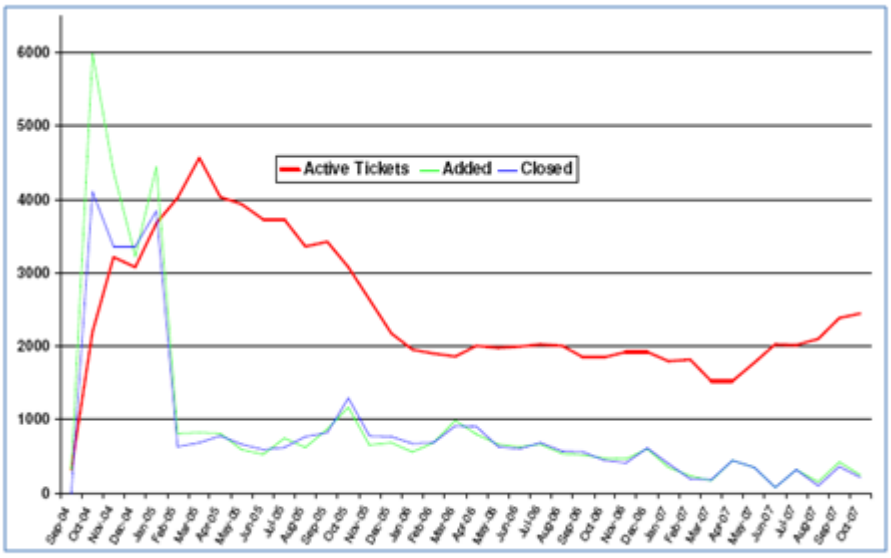

Figure 2. Help Desk Tickets

6. Recommendations

In the previous section, we examined IT project measures that were used by the State, EDS, the public, and counties. These measures were used by different parties to defend or attack CBMS. The disputes and litigation efforts were exacerbated by using disparate measures. The public and the counties were more focused on outcome-based measures while the State and EDS were mostly focused on process-based measures until counties and media backlash occurred. We suggest that if the State and EDS had been more focused on transparent outcome-based measures, along with process-based accountability measures, some of the adverse CBMS results may have been avoided. The State of Texas adopted-performance measures based on SEA reporting recommendations are useful for any state anticipating large IT projects with a huge failure risk [Keel et al. 2006]. However, the Texas guide only includes measures for general government projects, so we recommend appropriate measurements for government IT outsourcing projects. Appendix 4 lists all possible measurements based on our review of the CBMS case and the State of Texas case. However, complete control is costly, so measuring/controlling everything is not justified from a cost-benefit perspective. We identified several qualitative costs of the CBMS project due to litigation and compared these against the cost of developing the measures needed to defend the system (Table 3).

Table 3. Cost-benefit Analysis of Litigation vs. Developing New Measures.

	Litigation	Measurement Developments
Cost	• Potentially forced to revert back to the legacy system • Litigation related cost • Cost of delayed eligibility results • Loss of public creditability • Distraction of the State and counties activities and functions • Termination of government officials	• Development costs • Increased development time
Benefits	None	• Improved outcomes • Better communication between the State, counties, and the public • Decreased dependency on IT vendors • Time savings

By aligning the measures used by different parties, information asymmetry can be minimized during development phases and after implementation. Before disputes ensue, these measures can be used to validate IT project successes, justify additional budgets ($$ and time), and earn public loyalty as each phase is completed. Ideally the agency relationship between government principals and government agents can be replaced with a cooperative shared responsibility. The government, IT suppliers, the public, and the counties can share their vision, expectations, and norms during development. Through better communications during development, they can develop more useful measures which may reduce disputes and subsequent litigation. Figure 3 shows the recommended relationships among the various parties.

7. Conclusion

We started this research with the question of why and how CBMS could have better met public expectations. By carefully reviewing articles, white papers, reports, and newspaper media, we found that public expectations of CBMS were inconsistent with the State's (and EDS) expectations. These unmet expectations caused disputes and litigation initiated by the public. In order to better understand this phenomenon, we applied Agency Theory to the CBMS case and identified the respective roles of all parties involved in CBMS. CBMS had multiple agency relationships and multiple agency issues. The State is not the only principal, but also the public and the counties are principals who indirectly invested their money into CBMS as benefit recipients and users. Goals and interests of the State, EDS, the public, and counties were conflicted, so their risk preferences, information needs, and the expectations about the system were different; therefore, performance measures used should also be different and reflect the public's interest in transparency.

We reviewed previous literature about performance measures and identified commonly-used IT project measures. We examined how these measures were used by the State, EDS, the public, and the counties during CBMS development and implementation. Through careful review of government documents, reports, and newspaper articles, we found that performance measures used in the EDS contract were different from performance measures used by the public and the counties. CBMS project developers were focused on process-based measurements such as

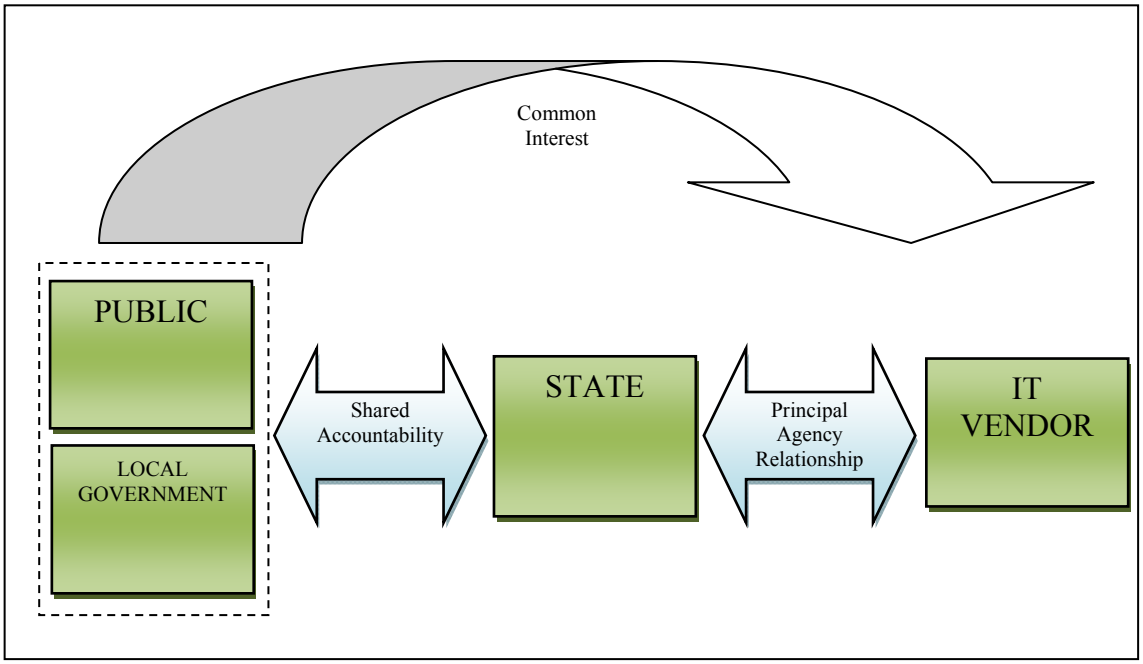

Figure 3. Recommended Relationship among the State and IT Vendors, the Public, and Counties

project specifications, project control, project estimation, project planning, contracts, and system testing as well as outcome-based measurements such as system performance, risk, cost, customer satisfaction, service level agreement, efficiency, and caseload, while the public and the counties were more focused on outcome-based

measurements. The public wanted transparency and the State focused mostly on accountability measures.

In order to avoid conflicts and litigation between the government and the public, the government IT purchasers (outsourcers) should focus on outcome-based measures (and process-based measures) in the development phases. We also suggest that a shared accountability be developed among different government parties to develop more consistent performance measurements. All parties need to share a vision, goals, and norms throughout the project and use common performance measures to achieve project success and reduce disputes and litigation. We also recommend the SEA reporting measures.

We provided evidence of mismatched measurements among different parties in the CBMS case study. However, we could not provide evidence of a statistical relationship between IT project failure and mismatched measurements because this study is limited to one case. In order to provide statistical evidence, further empirical studies should be conducted with a larger sample of failed government IT projects. Other studies could test whether better performance measures will reduce disputes and litigation or improve the success rate of government IT projects. Lastly, based upon the CBMS experience, the development of detailed measures for government IT projects should be considered since counties and the public tend to use simple outcome measures.

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Appendix 1. CBMS General Schedule [20]

Task	Start	End
Business Objectives and Needs		Completed
Business Process Reengineering		Completed
Information Technology Study		Completed
Feasibility Study		Completed
Conceptual Design		Completed
Detail Design	12/97	6/98
IAPD	5/98	10/98
IREP	5/98	10/98
Design Validation	4/99	6/99
Construction	6/99	8/00
Systems Testing	1/00	1/01
Acceptance Testing	3/00	3/01
Pilot Testing	6/00	7/01
Statewide Conversion, System Training & Implementation	6/99	11/01
State Acceptance	12/01	1/02

- The first five tasks have been completed and detailed system design commenced in early December 1997.
- Detailed Design (Task 6) was scheduled to be completed before July, 1998.
- Upon approval of Detailed Design, the Implementation Advance Planning Document (IAPD) requested federal funding (Task 7) and prepared the Request for Proposals (RFP) for the implementation contractor (Task 8).
- The implementation contractor was expected to be selected and begin development by August, 1999.
- Implementation was scheduled to begin (in phases) in June, 2000 with full system implementation targeted for December, 2001. [21]
- CBMS took a step-by-step approach to ensure that each element incorporated input from all involved parties and that the final product would represent useful technologies and a logical and efficient way of doing business.
- Each task must be approved before the next could be started.

[20] General Project Schedules, June 1998, http://www.cdhs.state.co.us/text/oss/cbms/CBMSDATES.html
[21] http://www.cdhs.state.co.us/text/oss/CBMS/CBMSPAGE.html

Appendix 2. CBMS Project Milestones [22]

Date	Activity
7/14/00 to 8/31/00	Anticipated Contract Period (36 month development and 5 years Facilities Management)
7/14/00	CBMS Contract signed by State and EDS
2/28/00	Joint Budget Committee reaffirms support
10/99	Survey of Medical Application Sites completed
9/22/99	Intent to award to Electronic Data Systems (EDS)
9/22/00	Contract Negotiations begin
9/13-17/99	Evaluation of Proposals
9/13/99	Vendor Proposals due
8/27/99	Revised RFP issued
8/16-20/99	Phase II Competitive Negotiations with bidders
7/15-8/13/99	Internal and External Review and prioritization of Technical and Business Requirements
7/14/99	Executive approval for Phase II Competitive Negotiations
6/17-23/99	Phase I Competitive Negotiations with both bidders
6/3/99	Executive approval for Phase I Competitive Negotiations
5/17/99	Declaration of Unsuccessful Procurement
5/14/99	Proposal Evaluation completed
5/3-4/99	Oral Presentations
4/5/99	Proposal due
3/1/99	Mail written Responses to questions and transcript of Vendor Conference proceedings
2/18/99	Vendor Conference (elective)
2/9/99	Receive second round of Vendor Questions
1/22/99	Mail written Responses to Vendors
1/7/99	Receive written Questions from Vendors
12/7/98	Release of Development and Implementation RFP
8/98	Study of Medical Application Sites outside County Department of Social Services
7/15/98	Implementation Request for Proposal (Task 8)
7/31/98	Implementation Advance Planning Document (Task 7)
6/30/98	Detailed Design (Task 6)
10/30/97	Conceptual Design (Task 5)
5/19/97	Feasibility Study (Task 4)
1/14/97	Information Technology Study (Task 3)
2/13/97	Business Process Re-engineering Study (Task 2) Business Vision and New Business Model
10/14/96	Department's Business Goals and Objectives (Task 1)
7/11/96	Selection of Eligibility Management Systems as Planning Contractor

- Task 1: Business Objectives and Needs. Defined high-level objectives of project through executive input.

[22] CBMS Project Milestones, February 21, 2002, http://www.cbms.state.co.us/links/Archive/arch_milestones.asp

- Task 2: Business Process Reengineering (BPR). Examined ways of doing business now and in the future through a project-specific BPR study, which found that current processes included some unnecessary layers of work and a significant amount of redundancy.

- Task 3: Information Technology Study. Studied current systems to determine whether modifications or additions would meet the needs spelled out in a description of CBMS. The conclusion was "no." It was determined that existing systems are too brittle and difficult to maintain.

- Task 4: Feasibility Study. Conducted feasibility study to flesh out concepts from BPR and price out the required completion steps.

- Task 5: Conceptual Design. Developed skeleton of what the system will look like; i.e., how pieces will fit together and interact.

- Task 6: Detailed Design. Fleshed out the CBMS detailed design. [23]

[23] http://www.cdhs.state.co.us/text/oss/cbms/CBMSNEWS.html#Colorado%20Departments (Volume 1, Issue 1 June 1998) (Revised 04/01/03)

Appendix 3. Overview of CBMS Testing Efforts

- Unit testing was performed by EDS to verify that the program worked as specified in the design. EDS tested single windows, individual components, and programs.
- Component testing was performed by system testers (EDS) to verify results compared to requirement and design documents (2002-2003).
- Verification testing was performed by system testers (EDS) and by UAT testers (State) prior to beginning formal system testing (2002).
- System integration testing (SIT) was performed by system testers (EDS) to ensure the CBMS met the design requirements.
- Joint interface testing (JIT) was conducted by system testers (EDS) and UAT testers in conjunction with third parties to ensure that interfaces between CBMS and other applications met requirements and performed as described in the design documentation.
- EDS tested the decision tables within the CBMS rules engine (unit testing). The Decision Tables Team tested the validity of decision tables to ensure that the flow of client information yielded the correct eligibility results.
- User acceptance testing (UAT) was performed by State testers to test the fully integrated application.
- The applications were tested again after defects were fixed to ensure that fixes did not cause unexpected changes (regression testing).
- System performance testing (SPT) ensured that CBMS application supported the planned usage volumes.

Appendix 4. Possible Measurements for Government IT Outsourcing

Focus	Detailed Measures
Project Specifications	• Scope • Size • Complexity
Project Control	• Project management software • Periodic project progress reports • Periodic project team meetings • Periodic comparison of actual results to planned results • Periodic comparison of project progress to schedule
Project Estimation	• Schedule activities • Project budgets
Project Planning	• Schedule of milestones • Specific deliverables • Scope • Staffing • Risk • Training • Shared understanding • Resource availability • Capacity planning
Contracts	• Type of contract • Contract management
System Testing	• Speed of processors • Memory capacity • Cache setting • Software configuration • Design errors and mis-specifications • System interface • Complete system testing
Service Level Agreement	• Agreement level of processing days for services • Agreement level of number of cases outside of timely processing • Agreement level of percentage of cases processed on time
System Performance	• Service availability and timeliness • Out-of-hours availability • Response in emergencies • Delivery to expected quality • Troubleshooting • Correct error fixes
Risk	• Assessment • Model • Contingency plan
Cost [24]	• One-time costs • On-going costs • Benefits
Customer Satisfaction	• Timely client service • Time for processing benefit applications • Ease of operation • Response times
Efficiency	• Accurate results • Error rates
Caseload	• Number of cases (caseload) • Number of backlog cases

[24] Performance-Based Management: Eight Steps to Develop and Use Information Technology Performance Measures Effectively. General Services Administration, Office of Governmentwide Policy, December 1996.