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## Consumer-Centric Reengineering at the Colorado Department of Revenue

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**CUSTOMER-CENTRIC REENGINEERING AT  
THE COLORADO DEPARTMENT OF REVENUE**

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**CASE STUDY**

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# CUSTOMER-CENTRIC REENGINEERING AT THE COLORADO DEPARTMENT OF REVENUE

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## PREFACE

In the summer of 1993, Renny Fagan, Executive Director of the Colorado Department of Revenue, in response to a directive by then Colorado Governor Roy Romer was faced with the following questions:

- How can I transform a bureaucratic state agency into a 'customer-friendly' organization at a time when public confidence in the government is deteriorating?
- How can I instill a work culture within my organization that encourages proactive change and improves transparency and accountability in our operations?
- How can I reengineer work processes and antiquated systems in my department in a way that adds value to our constituents and improves employee retention?
- How can I accomplish these changes within the budgetary, staff, and resource constraints set by the State Legislature?

Little did he know that the programs and projects that he would initiate over the next six years would transform the department's public image into a customer-focused organization.

**KEYWORDS:** Business process reengineering, customer-centric reengineering, customer relationship management, IT implementation, public sector.

Editor's Note: The events described in this case took place between January 1993 and May 2000, through a change in the State administration and in project management in January 1999. Appendices present a time line of events and a list of acronyms.

## I. BACKGROUND

The Colorado Department of Revenue (CDOR) is a governmental agency responsible for administering income, sales, property, and other taxes for the State of Colorado, licensing motor vehicles and motorists, and enforcing laws and regulations as mandated by the state legislature. Headquartered in downtown Denver, CDOR employed about 1500 people at the time of the case and was headed by Executive Director Renny Fagan, a direct appointee of Colorado Governor Roy Romer. The department's key statistics during the fiscal year 1998-99 are shown in Table 1.

CDOR's organization chart and a brief description of division functions are shown in Figure 1. CDOR was organized functionally along five lines of businesses: Tax, Transportation, Enforcement, Lottery, and Administration, which in turn consisted of eleven divisions. Each division is headed by a Director who reported to the Executive Director Renny Fagan and to Deputy Director Amelie Buchanan. Each director participated in four informal boards for advising the Executive Director in matters of CDOR policies. These advisory boards included Dealer Licensing Board, Gaming Commission, Lottery Commission, and

Table 1. Colorado Department of Revenue Highlights for FY 1998-99

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*Tax processing and collection:*

- Processed 2,071,680 individual income tax returns; 79.3 percent processed with 21 days and 99.5 percent within 45 days
- Processed 72,994 corporate tax returns
- Processed 1.58 million tax refunds; average refund: \$307 (including sales tax rebate)
- Processed 4.8 million documents for all taxes
- Mailed 2.6 million payment checks for all taxes

*Service to taxpayers:*

- Handled more than 1.4 million telephone calls regarding sales, fuel, and income taxes; 40 percent of which were handled through Interactive Voice Response (IVR) systems
- Maintained 186,619 active sales tax accounts
- Maintained 136,967 active wage withholding accounts
- Presented classes and seminars to more than 5,200 individuals

*Motor vehicle registration, driver licensing, and services:*

- Issued 905,826 driver's licenses
- Issued 165,476 state ID cards
- Received and archived 2,494,949 driver control and traffic record documents
- Handled 442,514 telephone calls regarding license suspensions, revocations, insurance, and "points"

*Ports of entry:*

- Collected \$6.2 million at fixed and mobile ports
- Cleared 5.6 million vehicles at fixed and mobile ports
- Cleared 20,707 driver/vehicle inspections

*Colorado limited stakes gaming:*

- Generated \$58.9 million for historic preservation, tourism promotion, and other state and local purposes
- Licensed 50 gaming establishments
- Employed 6,250 persons at casinos

*Colorado lottery:*

- Generated gross sales of \$374.2 million and total proceeds of \$97.4 million
- Administered funds distribution: \$30.1 million for Capital Construction Fund, \$22.9 million for Great Outdoors Colorado, \$35.7 million for Conservation Trust Fund, \$8.9 million for Parks & Outdoors Recreation

*Liquor enforcement:*

- Issued or renewed 10,047 vendors licenses
- Conducted 1,181 overt and covert investigations
- Inspected 1,962 establishments on-site for regulatory compliance

*Racing:*

- Generated \$7.2 million for the state's general fund
  - Licensed 7 racetracks: 5 greyhound tracks, 1 horse track, and 1 fair circuit horse track.
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Source: CDOR Annual Report, 1998-99.

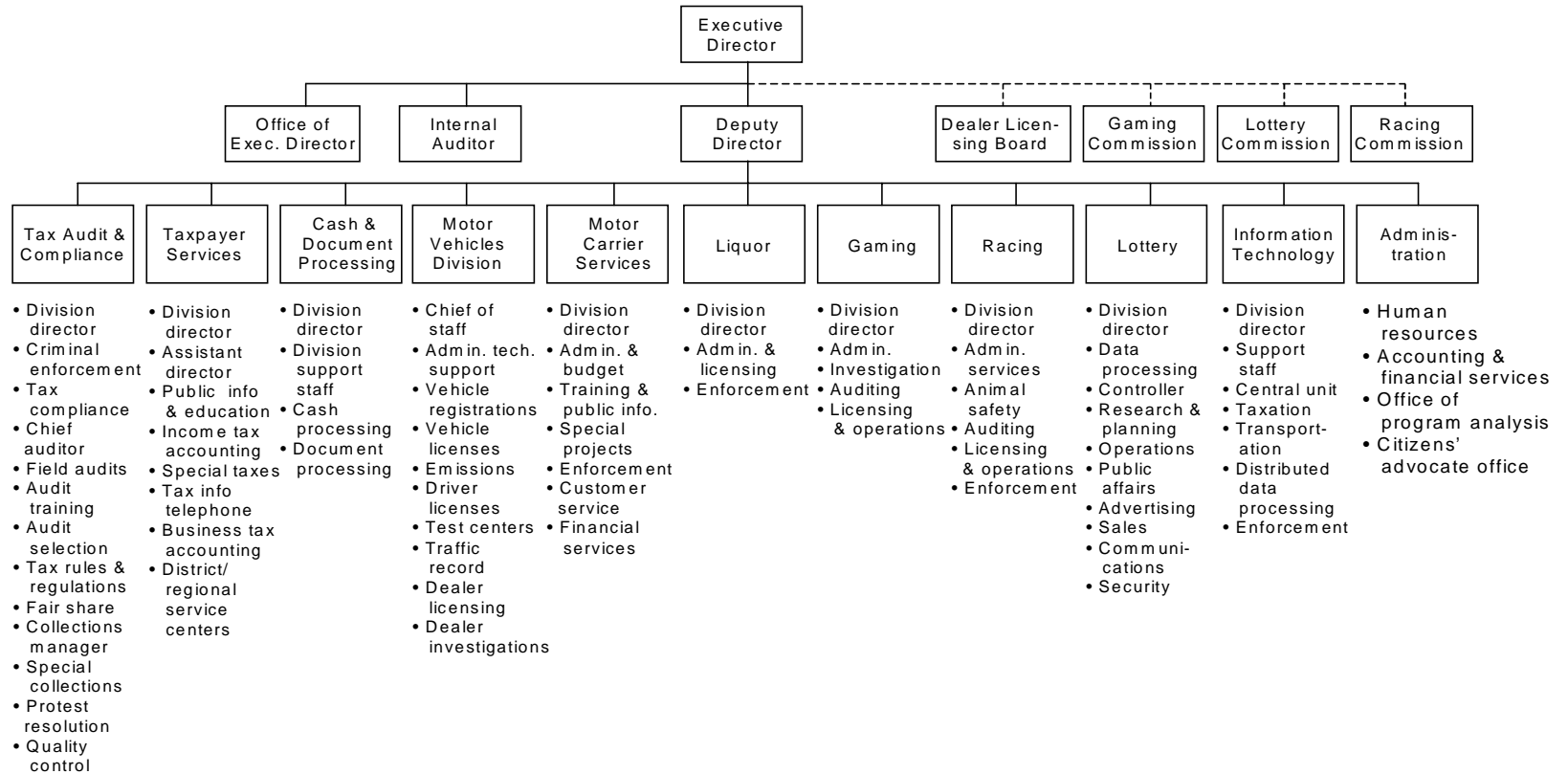


Figure 1. Colorado Department of Revenue Organization Chart (Source: CDOR Annual Report, 1999)

Racing Commission.

CDOR's Information Technology Division (ITD) was headed by Chief Information Officer Ron McNutt. McNutt joined the department in 1995 as its first CIO, manages a staff of 124 information technology (IT) professionals, and was responsible for all IT operations, including computer operations, programming, analysis, project management, and networking. Prior to McNutt, all central IT activities were managed by the operations division reporting to Deputy Director Buchanan, while individual divisions managed their own internal IT projects in a decentralized and ad-hoc manner.

Consolidation of IT operations and creation of a Chief Information Officer (CIO) position was a result of an Andersen Consulting study in 1994. Most of CDOR's core applications at that time, such as income tax processing and motor vehicle registration:

- ran on mainframes,
- were written in COBOL over a 35-year period,
- did not integrate well with one another,
- were incapable of accommodating changing regulations, and
- were not Year 2000 (Y2K) compliant.

The aging systems needed upgrading. In addition, new ways of delivering value to CDOR's customers (e.g., taxpayers, licensees) had to be identified and the Information Technology Department had to prepare to solve the Y2K problem. The outcome of Anderson Consulting's analysis was a series of reengineering programs, initiated between 1994 and 1999.

## **II. THE ROAD TO REENGINEERING**

CDOR's business objectives included:

- providing responsive customer service,

- providing open and convenient access to public information, and
- creating value for its customers.

Customers, in this context, referred to Colorado taxpayers, licensees, and other recipients of CDOR services. CDOR's objectives aimed to:

- make government operations more transparent to the public,
- make the agency more accountable to its constituency, and
- build and sustain public confidence in government.

This emphasis was reflected in the department's mission statement (CDOR Annual Report 1999):

*“Our mission is to provide exceptional service in an effective, innovative, and fair manner that instills the public with confidence, while fulfilling our duties to collect revenues, license qualified persons, and enforce the laws in an atmosphere that promotes dynamic solutions through meaningful employee involvement.”*

Fagan<sup>1</sup> highlighted CDOR's commitment to customer service as:

*“The age of commerce and service demands that governments keep up and excel in customer service... At CDOR, our overall goal is to increase the value that our customers get in return for every tax dollar spent.”*

In pursuit of its customer service goals, the department embarked on an ambitious strategy to initiate a series of customer-centric reengineering (CCR) projects:

- to reorient its corporate culture from process focus to customer focus,
- rethink mission-critical processes that impact customer value, and
- implement these redesigned processes using state-of-the-art technologies.

The primary thrust of this initiative was explained by Fagan as:

*“... to do things differently as opposed to doing them the same old way. We wanted to radically change the way we performed*

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<sup>1</sup> Quotes from Fagan, McNutt, and others were obtained during interviews with the author. Communications of AIS Volume 3, Article 16  
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By A. Bhattacharjee



*business, and we felt that CCR was the best way to bring about this change... Increasing customer value could mean providing customers with a broader menu of choices in say, paying taxes or getting licenses, restructuring our internal processes so that customers could realize the benefits faster, or making innovative use of technology to benefit the customer.”*

To determine processes that had the greatest potential to add customer value, CDOR adopted a two-fold strategy.

1. Between 1993 and 1994, senior CDOR executives went around the state to meet with citizen focus groups, understand their concerns, solicit their suggestions, and relay them back to CDOR’s planning board. Poor customer service, long waiting periods, and governmental bureaucracy were the most common complaints. Colorado residents also conveyed their grievances and complaints via their representatives in the state legislature. Customer feedback was also solicited through opinion polls, fill-in customer surveys, and town hall meetings, especially during major events such as municipal or state elections.
2. In anticipation of future process changes, CDOR embarked upon a major initiative in 1993 to train its internal employees in continuous process improvement (CIP) techniques. The purpose of this initiative was to discover ways to address customer concerns, instill quality in operations, and identify target areas for further improvement. An external vendor, Destra Consulting Group, was contracted to train CDOR employees in CIP principles, self-managed teams, idea generation techniques, and work process analysis and mapping. Team management issues included:

- setting ground rules for teamwork (e.g., meetings),
- securing sponsorship from senior management,
- creating and staffing team roles (e.g., moderator, leader),
- assigning responsibilities to team members,
- decision making via voting or consensus, and

- dispute resolution strategies.

Idea generation training included:

- interpreting survey, focus group, and opinion poll data, and
- learning techniques such as brainstorming, storyboarding, and use case analysis.

Process analysis was concerned with:

- identifying the scope (beginning and end) of a process,
- key stakeholder groups (customers, sponsors, etc.),
- inputs and outputs,
- subprocess activities,
- mapping techniques,
- eliminating process redundancies, and
- validation of refined processes.

Two types of CIP sessions were conducted: 3-day long intensive workshops for first-time participants and 1-day refresher courses for continuing employees. Each CIP team consisted of 3 to 15 members who were fully trained in a 10-step CIP methodology (Table 2). From August 1993 to June 1995, 56 CIP workshops were conducted, 765 CDOR employees were trained in CIP techniques, 90 CIP teams were formed (26 of these teams were training-only teams and employed human resources personnel only), and 41 CIP team projects were implemented.

Table 2. Continuous Improvement Process (CIP) at CDOR

Phase	Steps
Understand	Establish key work processes Identify customers and their requirements Document existing process (map/flowchart)
Evaluate/measure	Collect data and analyze Identify improvement opportunities
Improve	Problem solve and select solution(s) Pilot the improvement strategy
Institutionalize	Evaluate results and establish measures Implement and institutionalize the improvement Recognize and celebrate success

Source: Building blocks of CIP (1995)

Two of CDOR's first three CCR projects – licensing of gaming employees and state income tax processing – were direct outcomes of the CIP process. The third project – ports of entry processing – was an extension of a federal transportation project that coordinated commercial trucking activities between states along interstate routes. According to McNutt, project ideas were not entirely original, but implementing them was definitely a new experience for CDOR:

*“Very few of our ideas can be described as being created or ‘invented’ within our department. Most of these ideas aren’t new, but combinations of the ideas, or the way they were implemented were probably new and required some innovative thinking on our part.”*

Following a request for proposal (RFP) process, Andersen Consulting was hired in April 1994 to perform feasibility analyses of the targeted projects (gaming employee licensing, ports of entry processing, and income tax processing), assess CDOR's readiness for implementing these projects, and create an action plan for project management. Over the next year, Andersen teamed up with CDOR employees to analyze and document the scope and expected outcomes of the three customer-centric reengineering (CCR) projects, and assess what technology was required to accomplish these projects. Andersen gave focus and

structure to the target projects and suggested technology alternatives, but project prioritization and actual process redesign were done independently by CDOR employees.

Andersen provided CDOR with a series of guiding principles for change and detailed project management plans for the projects envisioned. Sample guiding principles are listed in Sidebar 1. In view of the limitations of CDOR's existing mainframe system, Andersen also recommended the deployment of a distributed client/server network for implementing the reengineered processes. The proposed network was expected to reduce costs of system maintenance, increase system flexibility, and most importantly, significantly enhance CDOR's responsiveness to customer needs. Each project is described in the next three sections.

#### Sidebar 1. Guiding Principles for Change

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Strive for quantum (10X) improvements:

Promote creativity and radical "out of the box" thinking.

Aggressively question existing business practices.

Align processes to meet customer needs:

Universal service: deliver services at the point of need.

Organize around outcomes: focus on customer-driven business results.

Immediate service.

Eliminate non value-added activities.

Ensure quality at source:

Do it right the first time.

Enter data only once, at the source.

Build systems to serve the majority, not the occasional minority:

Minimize burden on compliant taxpayers/licensees (customers).

Build systems based on incentives, not punishment.

Develop innovative end-to-end solutions:

Take a holistic view: examine business processes across functional and organizational boundaries.

Build system for the entire department, not individual divisions.

Effectively manage information capital:

Provide seamless access to information across division lines.

Make better use of existing information.

Empower employees:

Give employees the authority to make decisions on the spot.

Provide employees with knowledge, tools, and incentives to utilize their authority.

Foster a feeling of ownership.

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When change occurs, retrain and redeploy people.

Utilize cost-effective leading edge technologies:  
Use technology to manage change and enhance service.

Maintain public trust:  
Respect and protect privacy, ethics, and integrity.  
Deliver firm, fair, and swift punishment to intentional or habitual non-compliants.

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Source: Department of Revenue Strategic Plan (1996).

### III. THE GAMING PROJECT

Under a constitutional amendment passed in November 1990, gaming became legal within licensed establishments in the state of Colorado. CDOR's Gaming Division was responsible for regulating limited stakes gaming activities in the mountain towns of Cripple Creek, Central City, and Black Hawk in central Colorado. Proceeds of gaming funds were used for social uplift of the gaming communities, preserving historical relics, and improving transportation infrastructure in these communities. For fiscal 1999, total gaming revenues for the state totaled \$66.7 million, collected from 54 gaming establishments that employed over 6000 individuals. Limited stakes gaming revenue and distribution data for the last three years are presented in Table 3.

Table 3. Limited Stakes Gaming Revenue and Distributions

	1997	1998	1999
Gross gaming revenue	55.085	59.239	66.688
Division expenses/commission	7.145	7.647	7.948
State General Fund	17.505	19.613	21.544
State Historical Society	13.422	14.475	16.486
Department of Transportation	3.156	2.658	3.951
Gilpin County	4.345	4.630	5.331
Teller County	1.416	1.574	1.735
Contiguous County Fund	2.766	2.957	0
Black hawk	2.519	2.788	3.226
Central City	1.102	1.070	1.216
Cripple Creek	1.180	1.311	1.445
Local government gaming impact fund	-	-	3.328

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Note: All figures in millions of dollars. Smaller disbursements not shown.

As part of its responsibility, the Gaming Division was required to license all individuals working in Colorado's gaming industry. State laws required CDOR to perform a thorough background check of all gaming employees for prior criminal convictions or questionable financial dealings, before issuing them a license to operate in Colorado. For example, if a blackjack dealer wished to work in a Colorado casino, he/she would apply for a gaming license at CDOR. CDOR would then initiate a comprehensive background check with Federal Bureau of Investigation (FBI), Colorado Bureau of Investigation (CBI), law enforcement agencies (police departments, sheriff's office, city and county courts), and casino establishments within and outside Colorado (e.g., in Las Vegas, Atlantic City). This investigation typically took 6 to 7 weeks, during which time the applicant remained unemployed. This long waiting period was financially difficult for many casino employees coming from low-income households. Moreover, since casinos generally maintained tight vigil over employee activities, employees were generally not in a position to inflict substantial damage to gaming establishments or their patrons. In the end, only a very small percentage of applications were rejected. Hence, the 6 to 7 week waiting period was a costly price paid by the majority of applicants for potential infractions by a minority. Therefore, in late 1994, CDOR commissioned an internal CIP team of gaming officials to explore potential ways of expediting the licensing process for gaming applicants.

Following consultations with representatives from the gaming industry, the CIP team found a solution that was remarkably simple and inexpensive. In this reengineered process, applicants was issued a license on the spot, following a quick search against the state's internal database of casino operations, so that these individuals could start working the following day. The comprehensive background check by state and federal agencies, by law enforcement groups, and by other casino authorities continued after issuing the initial license. If any applicant was found to have a criminal background or history of questionable

financial dealings, his/her license was revoked retroactively and employing casinos ordered to discharge that employee immediately. However, this expedited licensing option was only available to low-wage employees. To prevent organized crime from entering Colorado's gaming industry, casino owners, managers, and other high-wage individuals were still required to go through the comprehensive 6 to 7 week check prior to obtaining a license.

Unlike most CCR projects, the gaming project required no significant capital outlay, no major changes in existing processes, and no new IT. Though the new process involved some automation (e.g., interfacing state databases with the licensing system), it was fundamentally driven by a simple cultural shift in CDOR's mindset from mistrusting gaming applicants to trusting them. As McNutt explained, bringing down the invisible barrier of mistrust was a huge shift for a government agency not accustomed to change:

*"The earlier process was based on mistrust; we were preventing casino applicants from working for 6 to 7 weeks because we thought that we may find something incriminating. Then we started to think, how many casino staff do we come across who have criminal records or should not be working in casinos. In reality, this was a very small number. Then we thought, why don't we give them the benefit of doubt when they file their paperwork, at least until we discover something unfavorable? How much damage can a small blackjack dealer really do? Moving away from our age-old beliefs was a huge cultural shift for us."*

Despite its limited scope and lack of technological sophistication, this project, according to Fagan, was a "tremendous success." It reduced the processing time for casino employee licenses from 6 to 7 weeks to one hour, and gained immediate popularity among casino employees and the gaming industry. More significantly, it had a deeper impact on the general populace because it signaled a philosophical change in the government's relationship with its citizens from one of mistrust to one based on trust. By bringing CDOR closer to its customers, the project improved the department's image as an organization

committed to customer service. In addition, the reputation gained in successful completion of the project helped CDOR attract additional funds from the state legislature for subsequent projects. Success of this project demonstrated that successful customer-centric reengineering need not necessarily involve large, complex business processes or expensive IT solutions; sometimes a small mindset change may be sufficient to generate quantum improvements in organizational performance.

#### **IV. THE WHEELS PROJECT**

By virtue of its central geographical location, Colorado was always a major thoroughfare for commercial trucks traveling across the U.S. CDOR's Motor Carrier Services (MCS) division was responsible for ensuring that all commercial traffic transiting Colorado's interstate highway system was in compliance with state regulations. MCS ensured that all trucks passing through state highways had appropriate registration and transit permits and were within acceptable weight limits. It also determined the amount of taxes to be levied on trucking companies based on the weights of their trucks. Revenues collected were used for highway maintenance, i.e., to repair the "wear and tear" caused partially by these trucks. Weighing and checking activities were performed at ten ports of entry and exit along I-25 and I-70 interstates (located at Cortez, Dumont, Fort Collins, Fort Morgan, Lamar, Limon, Loma, Monument, Platteville, and Trinidad), plus several mobile ports. In 1999, 5.4 million trucks were cleared on Colorado highways, 24,482 vehicles were inspected at fixed and mobile ports of entry, and \$6.9 million of revenues were generated. CDOR's port of entry activities for the last three years are listed in Table 4.



Table 4. Ports of Entry Statistics

	1997	1998	1999
Number of trucks cleared	5,077,692	5,426,848	5,604,609
Number of trucks weighed	4,533,397	4,763,132	4,815,622
Special fuel permits	10,878	7,945	7,429
Number of health and brand inspections	43,113	41,569	38,970
Hazardous materials permits	2,117	2,313	2,522
60-day permits	1,017	779	936
72-hour permits	19,189	19,172	19,696

Note: Includes data from 11 ports of entry and exit, plus several mobile units.

Until 1996, trucks were required to pull off the highway at designated ports of entry, form a single file, and be weighed in sequence at weighing stations adjacent to the highways. Truckers furnished registration and permit information to port officers at that time, which was manually entered into an IBM System/36 terminal. Upon clearance, trucks reentered the highway to resume their journey. For example, a truck headed south from Wyoming to New Mexico on I-25 had to make three stops within Colorado at Fort Collins, Monument, and Trinidad. These stopovers caused several hours of delay, resulting in additional costs for the trucking industry. Often, a long line of trucks trying to enter a port backed well into the highway, causing traffic congestion, inconvenience, and occasional accidents.

The “wheels project” was initiated in 1996 by MCS, in collaboration with the Colorado Department of Transportation (CDOT) to serve three objectives:

- reduce costs and delays in the weighing process,
- minimize accident hazards for other motorists, and
- streamline the weighing and registration verification process for MCS personnel (i.e., make it faster, better, and more accurate).

The project was a natural extension of a national initiative called CVISN (Commercial Vehicle Information Systems and Networks), funded in part by the Federal Highway Administration, for coordinating ports of entry and exit activities across ten pilot states (California, Colorado, Connecticut, Kentucky, Maryland,

Michigan, Minnesota, Oregon, Virginia, and Washington). While CVISN was a multi-agency project concerned with consolidating permits and registration, standardizing state-to-state and state-to-federal data transmission, and electronic credentialing of commercial vehicles, the wheels project was only concerned with operational issues within Colorado.

A high-level team of MCS personnel was convened to investigate potential alternatives to the existing process. This team met with representatives from the trucking industry, CVISN, and other states, and identified two solutions: weigh in motion (WIM) and automated vehicle identification (AVI). In WIM, weight detectors would be placed under designated segments of highway lanes at the ports of entry and exit, and trucks crossing these weighing points at regular highway speeds vehicles would be automatically weighed in motion (the length of trucks were also measured to distinguish them from smaller vehicles). In AVI, trucks would be equipped with mobile transponders to communicate registration and permit information to ground-based receivers at each port of entry.

The WIM/AVI system was just an automated data capture system; additional IT infrastructure was required to transmit this data for instant processing to MCS's central database server in Lakewood, Colorado. The distributed infrastructure, called Integrated Data Systems, provided key data to port officers seconds after the truck passed an WIM/AVI device to determine if the truck should be pulled over for questioning. IBM System/36 terminals, previously used at ports of entry for manual verification of registration and permit data:

- were not sophisticated enough to recognize and update WIM/AVI data,
- were not scalable enough to handle Colorado's growing commercial traffic,
- did not interface well with CVISN or state databases, and
- were no longer being supported by IBM.

Hence, a decision was made to replace these terminals with Dell Pentium

servers, connected to the Lakewood database via a client-server network and running an application designed by International Roadway Dynamics. The Lakewood server was upgraded to a Pentium processor running Microsoft Windows NT, Informix Online Database Server (ODS), and the Visual Studio 97 suite of applications. The new system also included an electronic data interchange (EDI) module to allow for electronic billing of trucking companies and electronic sharing of data with other state agencies and CVISN computers.

A pilot test of the new WIM/AVI system at Trinidad, Colorado was highly successful and received rave reviews from the trucking industry. A phased approach to system rollout was planned. The first phase was completed in August 1998 at the Trinidad and Dumont ports of entry, the second phase for Monument, Fort Collins, and Limon ports in April 1999, and the third phase for Loma, Fort Morgan, Lamar, and Cortez in October 1999. The System/36 replacement (along with the associated communications infrastructure (routers, switches, and 10BaseT cabling) installation statewide were completed in March 1999. The mobile ports of entry were planned for upgrade to laptop computers and integration with the state system in 2000.

The following is a timeline for the project:

Project Start	Officer Training	Phase 1 Rollout	System Upgrade	Phase 2 Rollout	Phase 3 Rollout	Mobile Ports
May 1996	January 1998	August 1998	March 1999	April 1999	October 1999	June 2000

In January 1998, MCS started an intensive training program to train its port officers in the skills of customer service, communication, stress management, Colorado rules and statutes, and computer knowledge. Future enhancements planned include implementing an electronic credentialing system to provide one-stop shopping for truck permits and registration, and building

interfaces to systems of other states and federal agencies and traffic clearinghouses. For example, the future system will use standardized data in MCS systems to allow:

- the Public Utility Commission to issue hazardous materials permits electronically,
- the Colorado Department of Transportation to provide roadside assistance to stranded truckers (via CDOT's Fasttrac system), and
- the Colorado State Patrol units to perform safety inspections.

The WIM/AVI system reduced the amount of time taken to clear a vehicle (in full compliance) from 10 to 12 minutes to less than 5 seconds, while significantly reducing the number of errors in manual data entry and billing. The project was completed under budget and 18 months ahead of schedule. Further, the new system greatly enhanced CDOR's reputation and credibility as a governmental agency committed to technological innovation and customer service.

## **V. THE INCOME TAX INITIATIVE**

Assessment, collection, and auditing of Colorado income taxes are among the most important and complex activities performed at CDOR. In 1999, CDOR processed 1.6 million individual income tax returns, 3700 corporate tax returns, 5.1 million tax documents, 2.5 million payment checks, and 1.28 million tax refunds. Table 5 summarizes Colorado's income tax data for the last ten years.

Until 1998, Colorado residents had two options for filing their state income tax returns. They could enter all tax information in a paper form (DR-104), compute their taxes using preprinted tax tables, and mail the form to CDOR. Alternatively, they could hire a professional tax preparation firm (e.g., Jackson-Hewitt) to complete their tax returns and file it electronically with CDOR. Approximately 70 percent of the returns each year were filed via DR-104A, a

“short form” version of the DR-104 form.

Table 5. Income Tax Collections and Disbursements

Year	Number of returns	Tax withheld <sup>a</sup>	Estimated payments <sup>a</sup>	Gross collections <sup>a</sup>	Total refunds <sup>a</sup>	Net collections <sup>a</sup>
<i>Individual income tax:</i>						
1999	1,577,869	2,476.8	560.4	3,378.7	471.7	2,900.0
1998	1,281,018	2,199.4	433.6	2,932.4	347.3	2,579.7
1997	1,255,121	1,996.6	360.6	2,621.3	319.8	2,296.9
1996	1,178,948	1,837.4	317.0	2,390.2	285.6	2,100.6
1995	1,123,814	1,656.2	291.2	2,160.6	250.9	1,906.3
1994	1,123,223	1,569.6	269.9	2,033.1	257.3	1,768.8
1993	1,116,360	1,523.6	209.6	1,913.0	267.6	1,637.5
1992	1,024,710	1,327.0	208.5	1,707.8	227.2	1,475.4
1991	1,060,018	1,258.4	196.2	1,611.8	246.2	1,365.6
1990	1,021,895	1,189.9	217.4	1,567.9	235.1	1332.8
<i>Corporate income tax:</i>						
1999	3,711	N/A	266.8	327.9	56.5	271.1
1998	3,597	N/A	235.5	277.6	53.2	224.3
1997	3,542	N/A	193.6	240.4	27.9	212.1
1996	3,161	N/A	194.8	231.0	35.4	195.6
1995	3,155	N/A	148.8	183.8	35.3	148.5
1994	3,536	N/A	139.5	173.6	50.0	123.6
1993	3,317	N/A	125.9	157.0	37.9	118.7
1992	3,256	N/A	133.9	158.6	41.2	117.4
1991	3,511	N/A	123.3	152.1	35.0	117.1
1990	3,551	N/A	147.6	190.9	27.4	163.5

<sup>a</sup> In millions of dollars  
(Source: Annual Report 1999)

Income tax processing required several layers of error checking and processing and the coordinated efforts of three CDOR divisions: Tax Accounting and Compliance (TAC), Taxpayer Services (TPS), and Cash & Document Processing (CDP). Tax returns received via mail were opened, date stamped, sorted, and forwarded to a clearing section to be reviewed manually for completeness. If complete, the return was given a control number and forwarded for data entry. Contract personnel entered the data into an IBM 3270 mainframe via terminals or microcomputers running terminal emulation programs. Automated computer edits directed returns with mathematical or keypunch errors to a CDOR analyst for correction. After error correction, a computer program compared the filed return with relevant documents for that tax account such as

employer-filed wage amounts and W-2 federal forms. If the account was valid and had no audit conditions, the return was posted to the account and a refund check drawn on the State Treasury (called “warrant”) or a bill for the outstanding amount was issued.

On average, it cost CDOR \$0.78 to process each paper-based return. This cost included:

- \$0.26 in printing and mailing costs,
- \$0.21 in data entry costs,
- \$0.07 in microfilm, retrieval, and shredding costs, and
- \$0.24 for pipeline FTE (full time equivalent staff time).

The bulk of the cost was incurred

- in staffing mailroom and clearing personnel,
- contract data entry,
- remittance processing, and
- error resolution.

The process took at least 11 days, about 85 percent of returns were processed within 21 days, and almost 100 percent were processed within 45 days. Colorado legislation required CDOR to make interest payments to the taxpayer if tax returns were not processed within three months of filing.

The existing tax accounting system was 35 years old and written in five different programming languages, including COBOL and assembler. Changes in tax regulations required occasional “patches” to the system. The process was ad hoc, and used software tools and IS personnel available at the time of each patch. The tax application was hosted on an IBM 3270 mainframe, and connected to data entry terminals and PC’s on a central Banyan local area network via Customer Information Control System (CICS) interface and SNA transmission protocol. Tax data was entered into batch files and loaded into a

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transaction processor at night, which error checked, processed, and stored that data on Virtual Storage Access Method (VSAM) files. The system:

- was costly to maintain,
- was inflexible to changing tax regulations,
- did not interface well with other CDOR systems,
- could not support the customer service levels expected by CDOR, and
- was not year 2000 compliant.

One instance of system inadequacy was realized when the State of Colorado decided to return a budget surplus of \$563 million for the 1998 tax year back to 1999 taxpayers in the form of a sales tax credit (“TABOR” refund). This change required adding a few additional lines to the DR-140 form to determine if a taxpayer was eligible to receive the credit (full year Colorado residency was a requirement for this refund) and to compute the amount of the credit (between \$142 and \$384 per filer). The existing tax system was not designed to accommodate such one-time changes, and reprogramming parts of the system to allow such computation was very expensive. As McNutt described:

*“A simple addition of lines to the current income tax form may take up to 900 man-hours. At the contract rate of \$70/hour, you are looking at an expense of \$60,000, which is simply not feasible in today’s environment of cost-cutting and downsizing.”*

A second instance of system inflexibility was the inability of the system to integrate tax returns across fiscal years for the same taxpayer. For example, if a taxpayer was delinquent for two years, the system could not recognize that the two annual accounts corresponded to the same taxpayer, and hence generated two separate delinquency notices. This discrepancy caused a lot of confusion among taxpayers and CDOR personnel alike. Also, the system did not track individual tax returns across time from filing to posting, so that when taxpayers called CDOR with questions about their tax returns, CDOR personnel could not inform callers of the current status of their returns. As John Vecchiarelli, Director

of Tax Accounting and Compliance (TAC), stated:

*“We had no formal procedures to track the processing of a particular return, so that when customers called us with questions about their return, we were unable to provide them with specific answers to their questions. Naturally, the caller wasn’t very happy on being put on hold for ten minutes and forwarded to three different CDOR people, and still not receiving the answer to his question... The tax system was built in the 1960’s and had clearly outlived its useful life.”*

With the existing tax system “creaking at the seams,” in 1990, Jim Davis, former Director of TPS and Vecciarelli proposed a complete renovation of the system. However, limited availability of funds and more urgent expenditures forced CDOR to postpone the proposal for the time being. The system reappeared on the planning board in 1995, with Vecciarelli appointed the project sponsor.

The Andersen Consulting estimate indicated that building a new system with electronic filing options and better tracking capability would take four years and cost \$12 million. This cost would include application development, public education, and continuing costs for leased equipment and additional communication lines (including toll-free telephone lines). However, the system would also result in significant cost savings due to personnel reduction, improved accuracy, and elimination of microfilms and would provide taxpayers with convenient filing options such as telephone. CDOR estimated that if 35,000 taxpayers utilized the electronic option in the first year of the program increasing to 100,000 filers by the year 2000, the department would realize a direct savings of \$19,000 in the first year, increasing to \$52,000 by the year 2000.

In 1995, CDOR assembled a “core team” of eight senior tax supervisors and assigned them the responsibility of examining the current tax system and proposing potential changes. This team included personnel from the Office of Tax Analysis, Taxpayer Services, Cash & Document Processing, Customer Protest Resolution Area, Fair-share Area (fair-share personnel performed



computer-to-computer matches to identify improperly filed tax returns), and Information Technology Division. Core team members met with CDOR employees involved in various aspects of the tax accounting process, made presentations, and tried to capture the current process pictorially. Citizen focus groups were employed to suggest improvements. However, accountants and professional tax preparers were not consulted due to lack of time. Vecchiarelli admitted that incomplete representation of stakeholder groups was a design flaw in the project:

*“We assumed that our core team had sufficient breadth of experience to be able to capture customer needs accurately. But their primary focus was on the needs of those users inside the system [i.e., CDOR employees]... They did use some citizen focus groups, but I don’t think we consulted all our customers. There are a lot of accountants and practitioners who do returns for individuals. We didn’t get their input... In hindsight, we could have done a better job identifying our customers and figuring out what they wanted, but we were seriously cramped for time at that point to do everything we wanted to do.”*

Despite limited analysis, a wide range of ideas was generated. Of these, three strategies were selected:

- three new options for filing tax returns electronically (Telefile, Netfile, and File-4-Me),
- redesigning the existing tax accounting process, and
- complete overhaul of the IBM 3270 mainframe used for tax processing.

The electronic filing options attracted the most attention since it was expected to eliminate two-thirds of the tax processing costs (in data reentry, mailroom processing, etc.) and provide taxpayers with superior service by:

- shortening the processing time and processing refunds more quickly,
- providing taxpayers the convenience of electronic filing without the costs of professional tax preparers, and
- making the tax return system available to taxpayers 24 hours a day, 7 days a week.

The first filing option, Telefile, would allow taxpayers to file tax returns via a touch-tone telephone. In this option, a taxpayer would dial a 24-hour toll-free number (1-877-TEL-FILE), and be prompted to enter their tax identification number and first two letters of their last name. An interactive voice response (IVR) system would read their complete name and address based on their prior year tax record. After verification, the taxpayer would enter his/her gross taxable income, withholding, adjustments, and other pertinent information using the numeric keypad on their telephone. The software would cross check the data for accuracy and completeness, calculate the caller's tax liability, and inform the caller of the same. Filed returns would be uploaded from the IVR system to CDOR's central computers in batch mode, for account comparison, returns posting, and refund or invoice issuance. The entire process was expected to take less than four days.

The second option, Netfile, would allow filing of tax returns over the Internet. Taxpayers would enter the web address for the Netfile system (<http://www.netfile.state.co.us>) in their web browser. The system would guide the taxpayer through a five-step process of filling out an online DR-104 form, validate entered data at every step, compute taxes, and provide an immediate confirmation of the filing. Taxpayers could also log on to the system at a later time to amend a return filed earlier. Netfile would hide the complexity of the system from the user, provide hypertext-based online help on specific topics such as explanation of line items on the tax form, and be fully integrated with electronic funds transfer and secure payment technologies so that taxpayers could make tax payments or receive tax refunds directly between their bank accounts and the State Treasury. Netfile's welcome screen is shown in Figure 3 and a sample data entry screen is provided in Figure 4.

The third option, File-4-Me, was aimed at individuals or families with relatively simple tax returns (e.g., single income households and full-year residents with no itemized deductions and no capital gains), who lacked the time

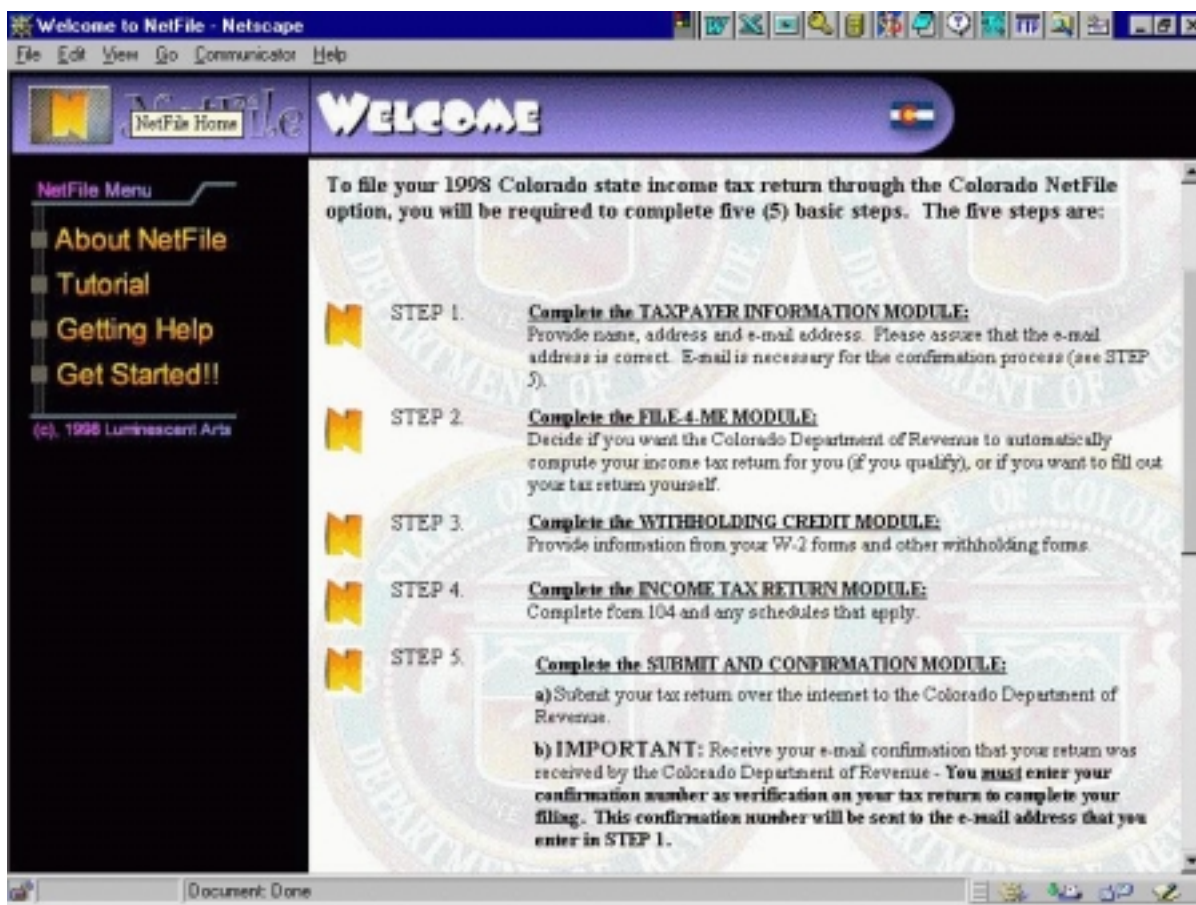


Figure 3. Netfile Welcome Screen

or ability to file state tax returns. Contingent on taxpayer authorization, CDOR employees would prepare a return for those individuals, based on their federal tax return for that year, and send them a bill or a check for outstanding or overpaid taxes.

Once the external customer interface was agreed upon, the income tax core team then turned its attention to analyzing and redesigning the internal tax accounting process. The team started with the “blue sky” (clean slate) approach, as recommended in the reengineering literature, but soon realized that this approach was too unwieldy and time-consuming for a fairly structured income tax process and resorted to a technology-constrained approach instead.

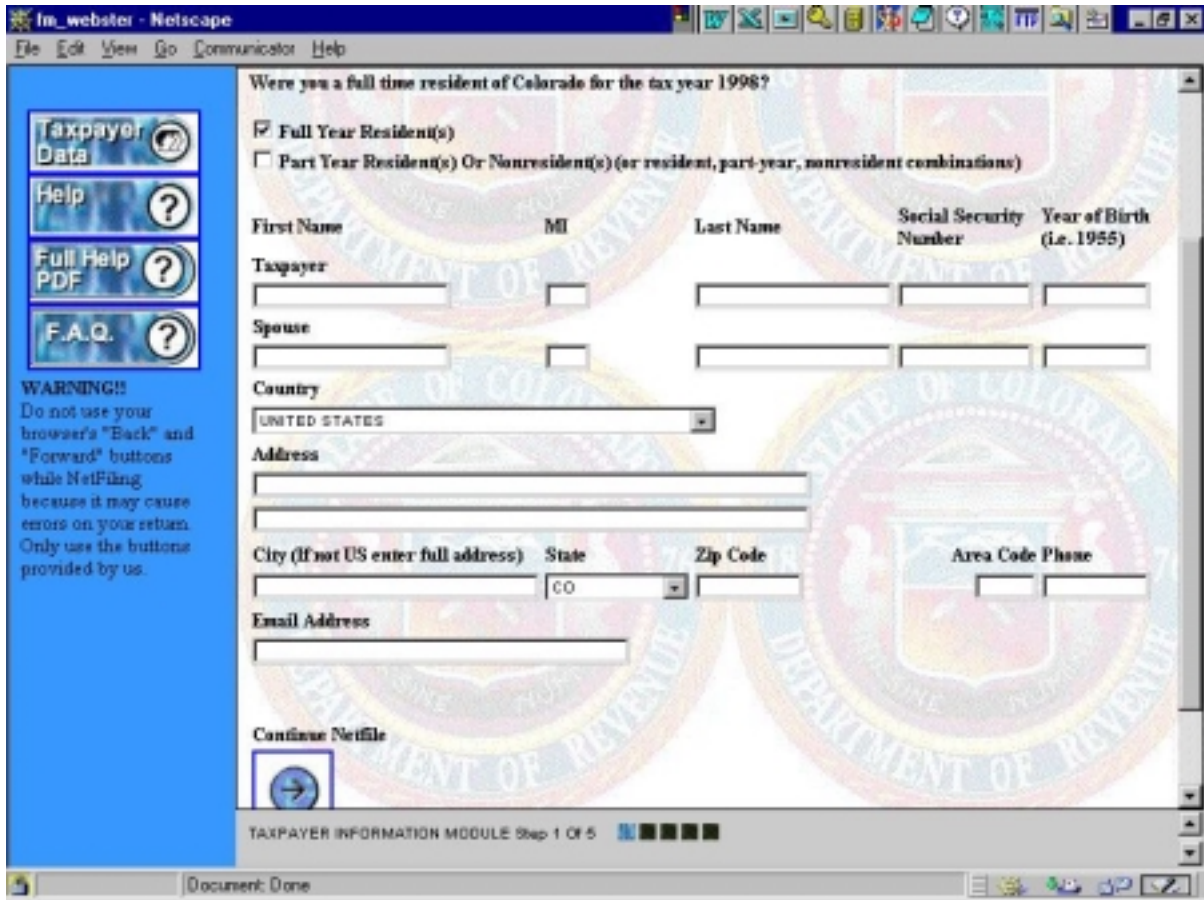


Figure 4. Netfile Data Entry Screen

The next several months were spent identifying and mapping individual activities in each subprocess within the overall tax accounting process. Several idea generation techniques were employed including brainstorming, storyboarding, and use case analysis (team members had acquired these skills during their earlier CIP training). The core team relied substantively on use case analysis. This methodology helped the team identify and document scenarios mimicking different business scenarios (e.g., processing request for refund re-issuance, resolving customer disagreements), which helped understand which processes, actors, and activities were involved in those situations and how. Hundreds of use cases were generated and documented by the core team over an 18-month period, with assistance from over 130 tax processing personnel at

CDOR. A sample use case scenario is shown in Sidebar 2.

### Sidebar 2. Use Case Scenario Example

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*Event 09: Taxpayer disagrees with tax assessment*

1. Taxpayer observes a discrepancy between his/her tax computation and CDOR's assessment, and calls to express disagreement and request further clarification. A "fair share" employee meets with the taxpayer, examines appropriate CDOR regulations, and arrives at a shared agreement on the nature and magnitude of the tax adjustment. A fair share bill is remitted to the taxpayer. Employee updates Case Management file for this taxpayer.
2. Same situation as above, but taxpayer does not accept explanation of fair share employee. Employee informs taxpayer that a formal letter of protest must be submitted. The letter is received and forwarded to the appropriate section for further conferences. Conferences are held and case is resolved. If case is not resolved at conference level, it is forwarded to the Attorney General's as the legal representative of CDOR. Case Management is updated.
3. Field Audit performs an audit and issues a billing. Taxpayer sends in a written protest. Protest is forwarded to appropriate section for preliminary review and possible settlement. Taxpayer does not agree with the initial review of protest and it is forwarded for conference at conferee level. Informal Conference is held and settlement is reached. Proper adjustments are made and Case Management is updated.
4. Same as 3 above except that taxpayer does not agree with proposed settlement at Informal Conference. Case is forwarded to the Director's office and referred to Attorney General's office as the legal representative of CDOR. Case Management is updated.

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(Source: CDOR internal document, 1996)

Results of use case analysis were documented in form of event flow analysis and process maps. Event flow analysis archived the inputs, outputs, purpose, and events within each subprocess, and process maps illustrated the physical flow of data within subprocesses (which helped during subsequent data modeling), captured relationships among data utilized by those subprocesses, and identified data that was external to the system. An event flow analysis example for a customer protest resolution subprocess is described in Table 6, and a process map of the same is illustrated in Figure 5. Initial process mapping were done on whiteboards (which had the ability to print out all contents of the board). These process maps were then displayed on the walls of a large room, for other CDOR employees to view and correct them, comment on specific aspects of a process, or suggest refinements to the process.

Table 6. Event Process Flow Example

<i>Event 09: Taxpayer disagrees with tax assessment</i>			
Process objective: To resolve customer protest, take appropriate action, and enter transaction to portfolio			
Phase	Compare transaction to CDOR files	Update taxpayers' portfolio	Take action
Purpose	To ensure appropriate relationship	To accurately reflect taxpayer activity & status	To communicate results to internal & external customers
Activities	Determine type of reporting Determine taxpayer ID Examine/create/update profile (balance due, etc.)	Post transaction as filed Recalculate transaction Confirm info with in-house gathered data Examine for intercepts or outstanding balance dues Determine adjustments Post adjustments Update profile	Notify customer Create appropriate reports
Outputs	Identified portfolio	Updated taxpayer portfolio Updated CDOR accounting system	Refund/bill Adjustment detail Taxpayer notification Computation/resolution detail
Inputs	Transaction from Tax Accounting & Compliance		

(Source: CDOR internal document, 1996)

Employees wrote their comments on yellow “post-it” notes and attached them next to the critiqued process. Vecchiarelli described the nature of employee interaction during process mapping as:

*“We received a lot of feedback from the user community on our process maps. Every single wall of Room 160 was covered with process flowcharts, and it was open to anyone who wanted to come and see them. In fact, the State Governor toured the room and saw the charts. It was a huge and dramatic effort. I don’t think everyone really appreciated that, but for the first time in the history of the Department, we had a mapping of how any process worked.”*

The process mapping and redesigning exercise was much more complex and time consuming than expected by the core team. The process of analyzing and improving the tax accounting process was so uncontrolled and culturally different from CDOR’s normal operations, that it seemed disruptive to some employees. As Fagan admitted:

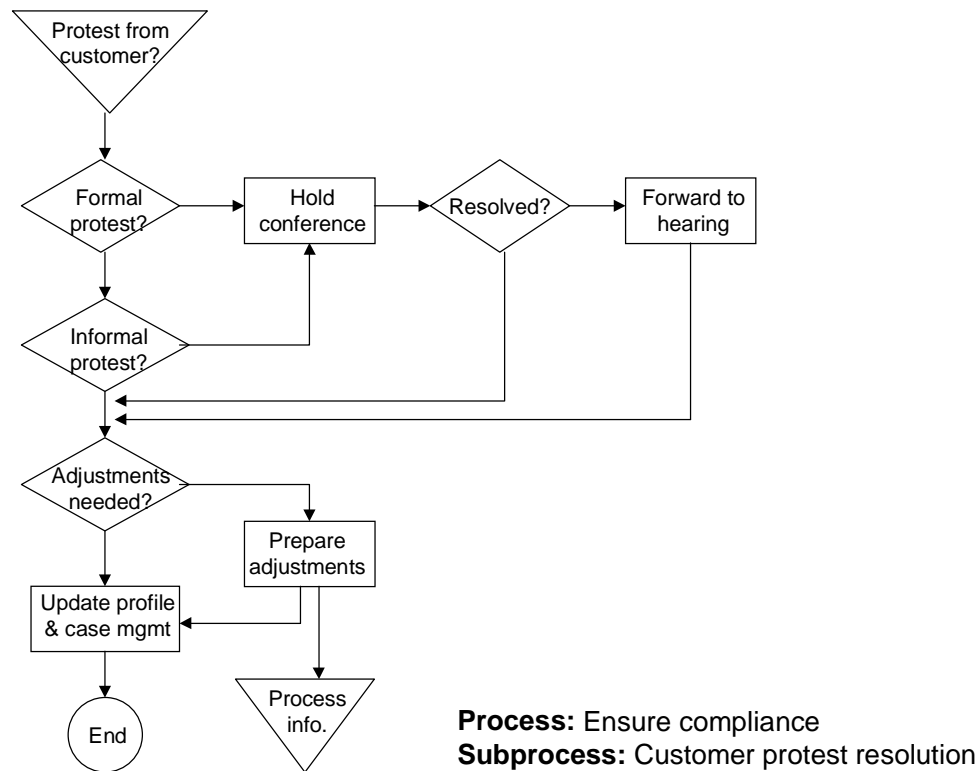


Figure 5. Process Mapping Example  
 (Source: CDOR internal document, 1996)

*“It was a little uncomfortable for me quite frankly, because being a graduate of the business schools of the 70’s, we were trained in the principles of scientific management rather than in breaking down or reconstructing processes that embodied scientific management. The concept of having eight highly paid people in a room doing nothing but brainstorming was very uncomfortable. It seemed very disruptive. It was a kind of controlled chaos that is uncomfortable for someone who is used to being in control.”*

The end result of the process analysis/redesign effort was a requirements specification document. This document captured desired requirements of the new system in form of requirements matrices, that included details such as methods to be used (manual versus automated), priority to be assigned to each requirement, and so forth. Requirement matrices were arranged by business

functions and reviewed by the core team for accuracy and completeness. A sample CDOR's requirement matrix is reproduced in Table 7.

Table 7. Requirements Matrix Example

Requirement ID	Requirement description	Use case #, Date of last update	Priority (Low/Med/ High)	System/ Manual/ Unknown	Status (Open/ Closed)
PRD0017	Match the signed "signature card" (using document ID) to tax return received from taxpayer	10217: 4/15/96 19933: 5/21/96	Medium	System	Open
PRD0018	Process certified mail by completing and forwarding certified mail cards	10255: 4/15/96	Medium	Manual	Closed
PRD0019	Handle undeliverable warrants	11303: 4/15/96	High	Manual & System	Open
PRD0019A	A. Void warrant	11303: 4/15/96	High	Manual	Open
PRD0019B	B. Cancel warrant	51020: 3/15/96	High	System	Open
PRD0019C	C. Initiate a COFRS transaction for cancelled warrant	11303: 4/15/96	Medium	System	Open
PRD0019D	D. Destroy warrant	11303: 1/24/96	Low	Manual	Open
PRD0020	Destroy documents after permanent copy is made and retention time set by system administrator expires	10230: 4/15/96	Low	Manual & System	Open

(Source: CDOR internal document, 1996)

Following process redesign, the core team met with ITD personnel and consultants from Andersen Consulting to decide on what IT architecture would best address the needs of the new tax system. The architecture issue was addressed in two parts: platform architecture and application architecture. Platform architecture consisted of hardware and software tools required to support the redesigned tax application, and included processors, operating systems, database management systems, storage devices, communication systems, and other infrastructure components. The goals of this architecture were:

- to reduce costs of data processing and system maintenance,



- to make fast, inexpensive modifications to business logic and data structures,
- to minimize reconfiguration of existing PCs and workstations,
- to be able to upgrade hardware or software independent of each other,
- to be in a position to integrate new technologies with the existing system as and when necessary, and
- to serve Colorado's growing population base responsively.

The final decision was to migrate the income tax application from the IBM mainframe to a new client/server network using UNIX-based servers. A three-tier architecture was chosen, with "thin clients" running only the graphical user interface but no application code, application servers running the tax application and client/server middleware, and database servers running the back-end tax database. Encryption technologies, firewalls, and secure sockets layer (SSL) transmission were chosen to enhance the security of tax data transmitted via the Netfile module. The initial database management system chosen was Informix, because CDOR already owned multiple licenses of this database. But ITD soon realized that the limitations of Informix would force them to curtail some of the proposed capabilities of the new system, and replaced it with Oracle. This indecision resulted in a 45-day delay and some additional cost.

Application architecture pertained to the design, construction, and management of the income tax application, including data elements, relationships, programs, and screens. The primary goals of this architecture were:

- to implement a "paperless" system, where data is entered only once at the source by taxpayers themselves and never re-keyed throughout the processing cycle,
- to separate the application's logical software layers (e.g., presentation, business logic, data access, data management) for convenient upgrades,
- to implement graphical user interface widely,

- to use a relational database management system that supported concurrent processing and symmetric multiprocessing (since the system was likely to be overloaded with concurrent users toward the end of filing season), and
- to build a vendor-neutral application that would allow for vendor interoperability.

This architecture consisted of two logical but related components:

- a data capture component and
- a tax accounting component.

The data capture component included the new Netfile and Telefile modules (File-4-Me was integrated within Netfile), plus a manual data entry interface. The tax accounting system would interface with Netfile data via secured firewalls, and with Telefile data via an interactive voice response system. The older tax accounting system, created using COBOL and CICS (Customer Information Control System - a transaction interface for mainframe systems), would be rebuilt using Powerbuilder (a fourth generation programming language, fully integrated with computer-aided software development tools, commonly used for building client/server systems<sup>2</sup>), and integrated with workflow technologies to allow better tracking of tax returns. Additional programming would be required to interface the application with CDOR's legacy systems such as the Automated Accounts Receivable and Audit Program and Revenue Accounting System. The complexity of the proposed tax system is evident from the database estimates presented in Table 8.

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<sup>2</sup> In Client/server systems an application is broken down into smaller components (called client and server processes), and each component is run separately on different machines connected by a computer network.

Table 8. Database Size and Performance Estimates

Database attribute	Expected	High estimate	Low estimate
Database size	33 GB	44 GB	27 GB
Number of tables	266	319	213
Table inserts per day (peak)	1,813,491	2,720,237	906,746
Table reads/updates per day (peak)	1,557,201	2,335,802	778,601
Number of concurrent users	75	100	50
Online response time (average)	< 1 second	< 0.5 second	< 1.5 second

Note: Estimates obtained by extrapolating from historical tax filing data.  
 (Source: CDOR internal document, 1996)

System construction was further complicated by the fact that ITD personnel had little prior experience with client/server systems. Initially, CDOR considered the option of outsourcing the entire project to an external consultant. But the uniqueness of the income tax application and its mission-critical nature motivated the CDOR to build the system in-house. A vendor was contracted to provide Powerbuilder training to ITD personnel, and in May 1997 (three months behind schedule), a team of CDOR employees, augmented by external contract programmers, started working on system design and coding.

System development was scheduled for completion in July 1998, but the system remained incomplete even after the development team worked through November 1998. The File-4-Me option was postponed due to lack of time and funds. The back-end client/server system remained incomplete, and the Telefile and Netfile modules were interfaced directly with the old legacy tax system. Application developers were also unable to do a comprehensive system test using actual field data; instead performed a minimal system testing using in-house data. In view of these limitations, CDOR decided to scale down its plans for building public awareness and electronic filing training for the 1998 tax year. Instead, the system was available to those technologically-savvy taxpayers who could use the Telefile or Netfile options without CDOR assistance.

During its first year of operation (1998 tax filing period: January 1 through April 15, 1999), 29,578 taxpayers filed their tax returns using Netfile and another

42,085 filers used the Telefile option. For the second year (January 1 through April 15, 2000), returns filed via Netfile increased to over 93,000 (at least 30,000 more than any other state in the country), while those filed via Telefile dropped to about 7000. The drop in Telefile returns were caused by an unexpected system failure midway through the tax season; the system was scheduled for reconstruction using Java (an object-oriented programming language particularly suited for Internet-enabled applications) following the tax filing season. However, Netfile returns were well beyond CDOR's expectations. The number using Netfile and Telefile are still very a small proportion of the State's overall taxpayer base. CDOR's goals of a paperless tax system will depend greatly on the diffusion of electronic filing among mainstream taxpayers and the department's ability to overcome behavioral resistance from less sophisticated taxpayers. As Richard Giardini, tax supervisor for CDOR's TAC Division summed up:

*"There's always some reluctance with any new technology... Simply put, electronic filing is the future. There will be pitfalls along the way, but we'll develop the technology to deal with them. We'll keep working out the bugs and make it easier for the non-computer person to use the system conveniently. We believe that Netfile will see growth in future as people get used to and be more comfortable with their computers."*

Building the new client/server tax system required some new IT hires (i.e., an Oracle DBA, an object librarian, and a few network personnel). However, CDOR still eliminated a net of 13 positions, via a hiring freeze when the TAC division lost some employees due to natural attrition in government jobs (but there were no layoffs). To Vecchiarelli, saving 13 positions was a positive contribution of the income tax initiative since "the government is often accused of bureaucracy, inefficiency, and adding people where they are not required."

The successful transition of the Telefile and Netfile modules put Colorado's tax processing system at the top of the nation. Telefile had previously been implemented at the federal level and in various states, while New Mexico

was the only state to implement the Netfile option, but did not have the Telefile option (until the time of this case).

## **VI. EPILOGUE**

In 1999, Governor Roy Romer stepped down as the Governor of Colorado and was succeeded by Governor Bill Owens. Governor Owens appointed Fred Fisher as CDOR's new Executive Director, to succeed Renny Fagan. On assuming office, Fisher reassessed the outcomes of the department's three CCR projects and concluded that though the gaming and wheels projects were highly successful, the income tax initiative could be considered a failed project. The customer interfaces (Netfile and Telefile) were popular among taxpayers, but the back-end system suffered due to cost and time overruns and ultimately had to be abandoned. Fisher hired KPMG (a consulting/auditing firm) to audit the income tax project and determine what went wrong. KPMG found several instances of lack of rigor in project management, which may have led to greater resource consumption than initially budgeted and consequent project slippage. Salient limitations highlighted by the KPMG included (KPMG Audit Report, 1999):

1. No formal project management methodology was employed to develop project estimates (budget, deadlines); only "best guesses" from system developers were used for this purpose. Many of those developers left during the course of the project, and new developers did not agree with the old estimates.
2. The "ramp-up" time required for new developers to come up to speed with system development was underestimated by as much as 20% due to inadequate documentation of requirements and system designs.
3. The user community (tax employees at CDOR) was alienated from system developers during the design process. No prototype was used for generating dialogue with users or soliciting their input.

4. Relative deficiency of client/server, Powerbuilder, and Oracle experience among ITD personnel and external contractors led to overall unevenness of design, coding, data structure, and interfaces. There was some lack of consensus on the soundness of data models and data structures. This problem became worse because developers operated in isolation from each other, the team approach was not employed, and coding standards were not adhered to.

Fisher realized that the income tax project failure was not caused by customer-centric reengineering or prior initiatives (e.g., CIP), but by inadequate project management, insufficient incentives (as evident from high turnover among contract personnel involved in the project), underestimation of resources (time, funds, and manpower), and improper contingency planning. Despite these setbacks, Fisher pledged to continue with the CCR tradition initiated by Fagan for future CDOR projects, while trying to revive the income tax project as much as possible. The "income tax initiative" project was renamed "Colorado Tax Application" to signal a major shift. Future projects earmarked for reengineering included modernization of the state's motor vehicle registration process, corporate income tax filing process, and sales tax accounting process.

Under Fisher, CDOR went through a major structural change. The Deputy Director position was eliminated to bring the Executive Director closer to the activities of individual divisions. The eleven previous divisions were regrouped into three groups, the Tax Group, Motor Vehicles Group, and Enforcement Group. Lottery, which was previously a distinct division, was folded into the Enforcement Group. Administration divisions, such as Accounting, Planning, & Budgeting and Information Technology Division were reorganized into a matrix structure, serving the functional needs of the three primary groups and maintaining a dual reporting structure to their own division and to the appropriate functional group. Five positions were eliminated on Fisher's first day in office and three more positions were eliminated within the next three months. However,

these headcount reductions were not mandated terminations, but rather positions remained unfilled as employees left the department or were reassigned.

The most important structural change was the hiring of Ron Olsen as the new Senior Director of Information Technology. Olsen came from Galileo International, a highly successful online reservation system company, and brought in considerable experience in large-scale information systems projects in highly dynamic environments. Olsen was assigned an organizational position above the CIO, and had the sole job of providing vision and leadership to CDOR's large systems projects, overseeing the management of such projects, and advising the Executive Director in issues involving these projects. To minimize project risks, Olsen and Fisher decided to evolve an incremental approach for modernizing all CDOR tax systems (individual income tax, corporate income tax, sales tax, etc.). Based on initial estimation, this strategy is expected to be implemented in six phases over a ten-year period. For each phase, the system would be analyzed, designed, coded, tested, and put into production before moving on to the next phase. The systems would have open architectures (to accommodate future growth and scalability), plug-in modules (for easier upgrades), and utilize common databases and other underlying technology (to reduce cost of maintenance). Systems designs would mostly be outsourced, and CDOR planned to propose funding for the first phase in the State Legislature during fiscal year 2002. Fisher explains the rationale for the new approach as:

*“One thing I have realized from prior experience is that as the size of a project increases, the project risks increase geometrically. Without a proper risk management system in place and without prior experience in large-scale projects, it is inordinately difficult to be successful in large systems projects. This incremental approach is essentially a risk management strategy; it probably costs more than traditional approaches, but the risk reduction certainly seems to be more than worth it. Of course, at this point, I can't say if this is the right approach. But I'll definitely have a better answer in another five years.”*

Fisher also addressed the previously neglected human resource aspect of CDOR's CCR initiatives. The income tax initiative, in particular, suffered from high employee turnover. To reduce turnover, Fisher conducted several face-to-face meetings with employees in different CDOR divisions to understand their needs better, improve their incentive structure, and increase employee satisfaction and retention. An employee tuition reimbursement program was initiated to help employees acquire necessary technology and business skills from local colleges. An employee recognition program was initiated to publicly acknowledge employees for their contribution to CDOR initiatives.

Simultaneous with changes at CDOR, Governor Owens commissioned a new Office of Innovation & Technology to provide vision and direction to the State's *New Century Colorado* policy initiative, provide strategic consulting services to individual departments, and maximize appropriate utilization of State's resources by coordinating infrastructure projects across state departments. Fisher hopes that coordination with this external initiative will ensure true and lasting change at CDOR, while enhancing its chances of success in large projects, delivering total customer satisfaction, and improving employee retention.

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## REFERENCES

"CDOR Annual Report, 1998".

"CDOR Annual Report, 1999".

"Building Blocks of Continuous Improvement Process," Vendor-supplied documentation (1995).

"Department of Revenue Five Year Strategic Plan," CDOR internal document (1996).

"KPMG Audit Report," CDOR internal document (1999).

## APPENDIX

### TIME LINE OF KEY EVENTS

May 1993	Governor Romer issues a directive asking all State departments to be more "customer friendly." In response, Fagan decides to integrate CDOR's planned reengineering projects with customer service to make them more customer-centric.
1993 - 1994	CDOR executives go around the state in search of potential reengineering projects that could deliver value to customers.
Aug. 1993 to Jun. 1995	Destra Consulting trains CDOR employees in CIP principles in anticipation of the planned reengineering projects.
Apr. 1994	Andersen Consulting hired to do feasibility analysis of three proposed CDOR projects.
Nov. 1994	Gaming project started.
Early 1995	Gaming project completed successfully.
Jun. 1995	Income tax initiative started with formation of "core team."
Late 1995	Ron McNutt hired as CIO.
Early 1996	Core team recommends Telefile, Netfile, and File-4-Me..
1996 - 1997	Existing income tax accounting process analyzed, mapped, changed, changes rolled back due to implementation concerns, and changed again in light of technology implementation
May 1996	Wheels project started
May 1997	Systems design and coding for income tax project started.
Aug. 1998	Wheels project Phase I rollout; final phase rolled out October 1999;
Nov. 1998	Income tax project halted due to lack of funds. Netfile and Telefile completed (and linked to legacy systems), File-4-Me postponed, back-end system construction left incomplete.
Jan. 1999	Telefile and Netfile goes into operation.
Jan. 1999	Governor Romer succeeded by Governor Owens; Fagan succeeded by Fisher as CDOR's new Executive Director.
Mar. 1999	Computer system upgraded for Wheels project.
Late 1999	KPMG presents a highly critical report of the income tax project
Early 2000	Netfile goes out of service; scheduled for replacement.
2000	CDOR undergoes structural changes. Ron Olsen hired. New long-term plans designed for reorienting future income tax projects.

## LIST OF ACRONYMS

AVI	Automated vehicle identification
CCR	Customer-centric reengineering
CDOR	Colorado Department of Revenue
CDOT	Colorado Department of Transportation
CDP	Cash & Document Processing
CICS	Customer Information Control System
CIO	Chief Information Officer
CIP	Continuous Improvement Process
COBOL	Common, Business-Oriented Language
CVISN	Commercial Vehicle Information Systems and Networks
DR-104	Colorado individual income tax return form
DR-104A	Short form variant of form DR-104
EDI	Electronic data interchange
GB	Gigabytes
IBM	International Business Machines (a hardware vendor)
IT	Information technology
ITD	Information Technology Division
IVR	Interactive voice response
KPMG	An external consulting/auditing firm
MCS	Motor Carrier Service
NT	New Technology
ODS	Online Database Server
RFP	Request for proposal
SNA	System Network Architecture
SSL	Secure Sockets Layer
TAC	Tax Accounting and Compliance
TPS	Taxpayer Service
VSAM	Virtual storage Access Method
WIM	Weigh in motion
Y2K	Year 2000

## CASE QUESTIONS

1. What are the advantages of a customer-centric organization (not available in case)? Does it make sense for governmental agencies to be customer-centric? Why or why not? Can the case's core issues be generalized to the context of for-profit businesses?
2. What are the key differences between traditional business process reengineering (BPR) and customer-centric reengineering (CCR)? Which type of reengineering is suited for today's business environment and why?
3. What are the key ingredients of a CCR project, as evident from CDOR's experience? What role does technology play in such projects?

4. What is your assessment of CDOR's conduct of the three CCR projects described in this case? What could they have done better?
5. Comment on the organizational changes implemented by Fred Fisher when he became the new Executive Director for CDOR. Were these changes required? Are they likely to be beneficial for CDOR?
6. Examine the web site for any corporate or governmental agency of your choice, and suggest which processes can benefit from CCR and how.

## **ABOUT THE AUTHOR**

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