Case study

A bumpy road to success (or not): The case of Project Genesis at Nevada DMV

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Abstract

This paper presents findings from the implementation of an integrated information system, Project Genesis, at Nevada Department of Motor Vehicles (DMV), USA. While the development and implementation was riddled with problems, the project was still labeled as successful. The case study identifies a range of issues in the organization and evaluates these based on different interpretations of various stakeholders. In a final synthesis, a contextual analysis of the emergent issues is conducted. Considerations for defining and managing the relative success of an implementation are presented.
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"*In the book of Genesis, God created order out of chaos. In the project Genesis, the Nevada Department of Motor Vehicles and Public Safety has created chaos out of order.*"

1. Introduction

Many people started calling September 7, 1999 Black Tuesday after the new Windows-based system went online at Nevada Department of Motor Vehicles (DMV). Nevada motorists had to wait as long as 8 h to conduct simple transaction and many others were turned away and told to come back another day. Many drivers were given temporary driver's licenses or 10 day passes for their cars.

Project Genesis was a seven-year, $34 million effort to upgrade the DMV's 20-year-old computer systems and business processes. The project started in 1996 and was to be completed by 2003. It was expected to reduce the need for hiring new workers at the DMV and improve customer service levels. The new system would enable customers to obtain driver license and vehicle registration from the same window, while previously, motorists had to stand in separate lines. After the system went online on September 7, 1999 people started hoping for the good old days of 2-h wait times.

2. Case study context

2.1. State of Nevada demographics

Nevada has been the fastest growing state in the US for the 15 consecutive years with 5.4% growth compared to the nation's average of 1.2%. Nevada's population had grown by 66% between 1990 and 2000, reaching almost 2 million. Most of Nevada's population is concentrated in the Las Vegas metropolitan area, which now exceeds 1.7 million residents (as per 2006 US Census Bureau). Henderson and North Las Vegas, two Las Vegas suburbs, are the fastest growing large cities in the US. Today, of nearly 2 million Nevada residents, more than half are licensed to drive and there were nearly as many registered vehicles in Nevada.

2.2. History of Nevada DMV

The Department of Motor Vehicles (DMV) and Public Safety was one of the State of Nevada's largest departments,

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employing almost 2200 people in 36 offices statewide in 1999. This department was created by legislative action on April 1, 1957. The department's responsibilities include enforcing statutes regarding vehicles and watercraft and licensing motor vehicle carriers. The department is accountable for all functions of the Public Service Commission, the Driver's License division, and the Nevada Highway Patrol. The department is organized into the following divisions: motor vehicle, motor carrier, driver's license, Nevada Highway Patrol, gasoline and special tax, administrative services, investigation, and training. Effective from July 1, 2001 the now former Department of Motor Vehicles and Public Safety split into separate departments: Department of Motor Vehicles and Department of Public Safety.

In 1999 the DMV handled 131,000 vehicle registration renewals and 10,000 new vehicle registrations a month. It also handled 30,000 license renewals and 6000 new driver licenses each month. About 65% of transactions were conducted in Southern Nevada. The DMV's core functions include: issuing drivers licenses, registering vehicles, and producing vehicle titles.

3. Project genesis

3.1. Defining project Genesis

By the early 1990s, Nevada officials became concerned over the increased wait times and other difficulties at DMV locations. On November 1, 1995 a legislature subcommittee authorized and launched a study to find the roots of the problems. A project team that included DMV staff, other state employees, and legislators was established. At this time, Best Consulting Inc. of California was hired to join the project team. The main purpose of this team was to study the business processes of the DMV and find ways to improve performance measures such as: cost, speed, and quality of service. The project team conducted an in-depth analysis of the current business processes and identified some of the main challenges of the DMV to be: expanded responsibilities, legacy information system, and inefficient work processes.

3.1.1. Expanded responsibilities

The team noted that DMV had evolved over time to meet the increasing needs of residents and to carry out state and federal responsibilities. These needs and requirements had changed over time. New programs and statues had been added and implemented. Nevada DMV had been a major source of information for the law enforcement agencies and courts. Considering DMV's limited resources and outdated IT systems, responding to these demands had been a major challenge. As a result of the DMV not being able to properly accommodate these expanded responsibilities, service quality had decreased over time.

3.1.2. Legacy information system

The DMV's IT systems were developed in early 1970s. The systems were altered and patched in an attempt to support the increased demand and new government processes. The legacy system was maxed out and proven to be incapable of handling the current volume of transactions efficiently. DMV had two separate systems, one for handling registration and titles and the other for driver's license information. These systems were designed separately and by different designers. Lack of communication between the two systems resulted in the storage of duplicate data. Updating customer information was a major issue, since it had to be done on each system separately. Customers got really frustrated when they found out that their information was not current, when in fact they had just updated it on another DMV section. Each system held much of the same information. Maintaining these systems was very difficult and costly for the DMV.

3.1.3. Inefficient work processes

In the beginning, the DMV was organized around the programs and not the customers. Driver's license and vehicle registrations were separate divisions. In order for a technician in licensing division to access registration, she had to log off the licensing system and log on to the registration system and vice versa. During this process, technicians experienced many computer crashes and got very frustrated. Most technicians were not trained to work on both systems. When a customer needed a combination of services (registration, title, or driver's license), he or she had to stand in different lines for each service. In many instances, after a long wait, customers were told that they did not have sufficient information to complete the transaction. Since the system did not support many of the existing business processes, technicians were required to manually record information and prepare receipts using calculators. If the information was not available on the system, a technician had to leave her station and search for the information on microfiche. Customers viewed DMV as a confusing maze, and perceived the service to be very slow and labor intensive.

In June 1997, Nevada's Assembly Ways and Means Committee approved Project Genesis. This project was to replace DMV's outdated computer system and completely change the way the Department conducted its business. The new system was to integrate licensing, registration, and titling functions, as well as other data kept by the DMV, into one system. The project was broken down into the following phases:

- *Phase I-Foundation phase*: During this phase four components were focused upon: system development, continuous improvement, organizational change, and change management. Functional requirements for the integrated system were developed and a data model designed. A detailed plan, regarding what the integrated system would be required to do, was also created. Vendor research was conducted for add-on technology.
- *Phase II-One stop customer service*: Phase two was built on the foundation phase. The base-integrated system

was designed, developed, and implemented. This provided a core system that was to be built on in phase three. Kiosks were to be implemented, to provide information to customers regarding driver's license requirements, registration, and title requirements. A phone-processing center was also to be implemented to answer specific customer questions. This would alleviate the traffic at DMV offices. Integrated Voice Response Unit (IVRU) was to be established for inquiry purposes. Furthermore, a court interface was to be designed. Through an automatic transfer of data, courts were to be able to obtain conviction information. Organizational restructuring would also have occurred, as well as employee training.

- *Phase III-Alternate service methods*: This phase built on phase II by adding additional technologies, such as digital document imaging, online and phone registration, and renewals and renewals by outside vendors such as those who did smog checks.

A set of guiding principles was developed by the project team to keep the project on track through completion. These principles were to transcend the project and provide focus for the project's final results. These guiding principles, as stated by the project team, are:

- every recommendation must support the mission of providing excellent customer service;
- customer satisfaction requires rapid service;
- build an empowered organization;
- provide customers with alternatives to walking into the DMV office.

The initial go-live date was scheduled for the 4th of July weekend in 1999. Since conversion from the old system to Genesis required 3 days, it had to be done during a 3-day weekend. Also, it was decided that implementation would have to be done all at once. Officials believed that it would be impossible to keep the two systems running at the same time. All data would have to be input into both systems in order to maintain database consistency.

As the July date approached, the launch date was pushed back to Labor Day. Everyone involved agreed that the system had too many bugs and it was not operational. This delay did not go unnoticed; the Deputy Director was forced out, politicians started pointing fingers and the press was having a field day. As Labor Day approached, the system was still full of bugs and it was clear that it was not yet ready. However, since the contract with the old system was due to run out before the next 3-day weekend (Nevada Day), the Governor insisted on going through with the implementation. By going live on Labor Day, the DMV would have a backup system to fall back on in case of total disaster.

On September 7, 1999, also after a 3-day weekend, the DMV started using Genesis at all of its locations. The system was a disaster from the beginning. There were thousands of bugs, employees had no idea how to use the new system, and customers had to wait for hours.

There was a contingency plan of reverting back to the old system by noon of September 7 and this decision was to be made by the new Deputy Director who was monitoring developments from a 'war room' in Carson City. The decision was made to continue with Genesis even though every employee was begging to go back to the old system. Did the new Deputy Director really have a choice, or was the decision made by the Governor who told her to 'get it done'?

Members of a legislative subcommittee met in early October. They agreed that the new computer system had too many bugs and the old program should be revived temporarily. Governor Guinn said that abandoning Genesis is not an option—this is not a time to duck our head and run for cover. He added that taxpayers' investment in Genesis must be protected. Shortly afterwards, the Governor announced a plan to remedy DMV woes. The plan was comprised of the following five points:

- emergency hiring of 42 workers;
- 24 hr shifts at the DMV to catch up with mail-in registration backlog;
- 30 day grace period—police would not issue tickets due to registrations or licenses being overdue by less than 30 days;
- phone hotline established;
- several new registration technologies, including using the Internet and telephone to register cars, will be implemented faster than expected. The new services should be in place by June 2000.

A month after these steps were announced, things started getting better. Average wait times in Las Vegas were reduced to around 2 h 30 m. The DMV officials testified that Genesis would never be faster than the previous system. On the old system, it would only take about 4 min for the transaction to be completed but on the new system it could take as long as 15 min. However, anyone who does multiple transactions will save time since they only have to stand in one line. The DMV estimates that 60% of the customers who visit their offices are conducting more than one transaction.

3.2. Employee training/staffing

Prior to the implementation of the new integrated system, employees had to be trained. The first step was cross-training. Since employees were assigned to one workstation before the implementation, they only knew how to process transactions for one of the divisions; driver licenses or vehicle registrations. Therefore, all 500 technicians had to be trained about operations they were not familiar with. Training began in October 1998 and continued through August 1999. The existing Honeywell Legacy System used only a keyboard, but due to the fact

that the Genesis program would be Windows based, employees were also involved in classroom training to learn how to use the Windows platform. Employee's level of computer literacy varied, from those who had to learn how to use a mouse for the first time, to others who were quite experienced. In addition, the DMV set up in-house stations to familiarize employees with the mouse.

Two employees from each DMV were sent to an extensive training course on the new system. The training lasted approximately 6 months, by which time they became 'wizards'. The purpose of the wizard was to assist other employees when they had questions regarding the new program. The remainder of the technicians received one 8-h course on the new system. This training occurred between the months of April and May 1999. However, the system that the technicians were trained on was not the same system that they would eventually use, since the programmers were still in the process of completing the new system. Therefore, employees was trained on parts of the program that were still not fully developed!

The training system contained many bugs, and employees felt that the information they were learning was not useful, due to the fact that it would be altered before they would use it. Employees' handouts did not even match the screens that they were practicing on, and they were told that the screens would probably change by the time the program was released. In essence, the technicians learned to operate a different version of the system than what they would be utilizing in their jobs.

In August 1999, 'wizards' received additional training, 1 day a week for 4 weeks. Even though the last training sessions were days before going live, training was not being conducted on a final version of the application. It was evident to all the wizards that participated in the training sessions that implementation would be a disaster. The system had too many bugs and would not be ready by the 'go-live' date of September 7, 1999. On the morning of September 7, each 'wizard' was standing behind 4 or 5 technicians in order to help them out and to try to guide them through all the necessary functions. The wizards were already 'highly stressed' since they were anticipating the upcoming disaster, but the technicians, whether they were aware or not, could not care less since they were going to be in their own nightmares; they had to change the way they did everything, without the help of any relevant training. A DMV official observed, "Some technicians did not know how to use a mouse; others had difficulty with simple steps as data input or changing screens."

As time progressed, technicians are able to process all the different transaction types and are comfortable with the new system, but had difficulty when something went wrong and 'thinking outside the box' was required. No additional training was however provided. When there were changes to the system, technicians received memos outlining the modifications and the new processes. One technician complained, "They expect us to read these memos while helping out all the customers that are waiting in line."

3.3. Backlog for mail-in registrations

During the training period, both the DMV field offices and the mail–in facility were facing major staffing issues. As mentioned, two employees from each location were sent for extensive training. Other technicians had to be cross-trained and were spending a lot of time away from their divisions. In September 1999, the backlog of mail-in registrations had grown to over 56,000 registrations, versus the usual 12,000. Governor Guinn addressed this problem by instituting 24-h shifts till the department caught up with the backlog. By the middle of December 1999, the backlog of mail-in registrations had gone back to the normal level of 10–12 days.

3.4. Employee morale

It is relevant to mention that employee morale suffered during the implementation process. Many employees decided not to take the heat and left their positions. The employee turnover rate was very high during this time. DMV had new employee classes starting every week with as many as 15 new hires in each. In addition, DMV started hiring part-time employees. These employees were trained for only 4 h and were told that they only have to perform one function, such as operating the camera or handling change of addresses. It is also important to note that DMV employees are the lowest paid of all of Nevada's state agencies.

3.5. Consultants role

The project team had originally visited several other DMVs and considered purchasing one of the programs being used at another DMV. However, neither the consultants nor the DMV officials were able to find an adequate program. The project team concluded that development of a customized system would be the best alternative for DMV. A State Senator defended the decision to make rather than buy based on the past experiences when Nevada had spent $8 million to buy a welfare computer program from Illinois, and another $100 million to fix it. The DMV project was expected to take about 7 years. Considering the size of the project, it was clear that the State did not have the expertise or the resources to implement the project. After extensive study of possible candidates, Deloitte and Touche Consulting (D&T) were hired, in 1998, for around $10 million and Best Consulting, a change management firm, for $3.6 million.

D&T was given the task to design and develop the program and provide training and corrective maintenance. The firm had no previous experience working with DMV systems. However, D&T had done about 30 big computer projects for statewide use by agencies outside Nevada. They were chosen because of their extensive knowledge and

experience in a client server environment and their ability to develop graphical interfaces.

At the beginning, communication was poor and unorganized. Consultants were getting orders from many different persons at the DMV. Each one had his/her vision of what the system should do and how. Things could be so confusing that two conflicting requests were made by the DMV during the same meeting. D&T representative would not be sure whose orders to follow. According to one of DMV's IT staff, "this is where Best Consulting should have come in to resolve the conflicts". The original contract ran till the end of 1999, at which time D&T agreed to fix an additional 313 bugs at no charge. At the same time, the state paid the consultants $500,000 for system upgrades that were not on the original warranty. Early in 2000, D&T agreed to provide 6 more months of programmer man-hours in exchange for, among other things, the right to use the framework and base of Genesis in other future projects. In fact, after Nevada, D&T has developed DMV systems for other states.

The Best Consulting contract was for oversight and "quality assurance". That included a report on any risks that will need to be managed during the testing process, and recommendations to mitigate risks. Change management in the organization was relatively important because the organizational structure was changing from two divisions (and two software systems)—one for registration and titles and another for driver's licenses—into an integrated division.

The state had sued Best after paying them nearly $1 million for the Taxation Department program, which figured in the loss of millions of tax dollars for state and local government coffers. Early on, DMV officials were aware of the tax agency situation but went ahead with Best Consulting anyway. As mentioned, Best was paid $3.6 million in 1998 but it is not clear what, if any, services they provided the State.

3.6. Cost

According to legislative records (2003), the project was estimated at $33.7 million. In 1997 the Legislature appropriated $17.8 million of which $343,000 was turned back to the state treasury. The 1999 Legislature appropriated $8.3 million more. By October 1999, a total of 25 million had been spent. In November 2002, when DMV officials were queried for purposes of this case study, they claimed that the project was on track and had not exceeded its budget.

Besides direct cost, Project Genesis has had other costs to the community. These costs have not been calculated and are not part of the figures from above. Some of these costs are due to side effects and its consequences to the community as many stakeholders suffered financially due to the DMV delays. Salvage yards, auction companies, car dealers, title-transfer companies, and towing companies, all lost revenue. One must also take into account the cost of being away from work while customers waited in line at the DMV.

3.7. Alternative technology

Phase 3 of project Genesis was all about alternative technologies and how such technologies would give motorists choices as to how they do business with the DMV. Governor Guinn accelerated the implementation of this phase after the disaster of September 1999. In April 2000, eligible Nevada drivers began renewing their vehicle registration at some emission stations and renewing their driver license or vehicle registration by calling 877-DMV-STAT. A month after those programs were launched, the DMV began offering vehicle registration and driver license renewals to eligible drivers on its Web site. During 2002, digitized driver licenses were made available to motorists. The department has achieved significant results in developing and implementing alternative technologies. As of November 2002, in addition to the services mentioned above, DMV's website offers the followings:

- late registration renewals,
- fee calculations and estimates,
- downloadable forms,
- answers to frequently asked questions,
- payment by major credit cards,
- driver history reports.

At the time of this research there were 14 emission stations in Las Vegas area and two stations in the Reno area, where motorists can smog their vehicles and renew their registrations onsite. Of these only two emission stations, one in Las Vegas and one in Reno, could dial in to the DMV system. The other stations use the Internet to do the renewals. In addition, there were two car dealers in Las Vegas area that could register the vehicles that they sell. Future upgrades include the placement of kiosks, or computer terminals, at field offices for the customers who prefer to go to the sites but do not need to talk to technicians.

According to a report published by National Telecommunication and Information Administration (NTIA) in 2000, 41% of people in Nevada had a computer and access to the Internet at home. In addition, many motorists who did not have access to a computer at home had access to a computer and the Internet at work, schools, or libraries. Based on a report provided by DMV, a busy technician serves about 35 customers a workday or 8750 customers annually. If only half of the people with Internet access were convinced to conduct their transactions with the DMV using the Internet, there would be 422,183 fewer annual visits to the DMV offices. This is equal to 48 virtual employees serving customers. Considering the fact that each employee, on average, costs DMV about $40,000, there would be a cost saving of $1,920,000. As of

November 2002, only about 15% of those eligible to use the alternative technology were doing so.

The DMV realized the potential cost savings related to Internet usage and hence launched public education campaigns to raise consumer awareness. These campaigns have proven to be successful but the benefits would only last for a short period of time. It has been DMV's experience that Nevada motorist's top of the mind awareness faded after a month or two. Historical data indicate that one-shot campaigns can boost, though not sustain, alternative technology usage by as much as four percentage points. Currently, the main goal for the DMV is to have campaigns that would continue to reach eligible motorist on the threshold of having to renew. Alternative technology was introduced to Nevada in April 2000. In the first year only about 96,000 people chose a use-alternative technology. The 250,000th alternative transaction took place a little over 2 years later on July 2002. As of 3rd week of November 2002, a grand total of 365,544 transactions had taken place outside DMV offices. In 2005, 12% of the 1.37 million registration renewals were processed via the DMV kiosks.

4. Case study analysis—what went wrong?

The question of success and failure related to the adoption of computer-based information systems in organizations is a concept that is not easy to define. DeLone and McLean (1992) argue that a consensus concerning measures of information systems success does not exist and presented a framework with six interrelated variables to analyze information systems success: system quality; information quality; system use; user satisfaction, which have an individual impact and an organizational impact. Later, they developed the framework and include the concept of net benefits (DeLone & McLean, 2003, p. 25). Since it is not easy to objectively evaluate information systems success, user information satisfaction is frequently used as a surrogate measure of IS success (DeLone & McLean, 1992, 2003; Melone, 1990). However, a computer-based system can be perceived as successful by a group of stakeholders and unsuccessful by another.

The literature presents several factors why information systems projects may fail (Caldeira & Ward, 2003; Flowers, 1996; Holland & Light, 1999; Somers & Nelson, 2004). Common success factors in the literature are, for example: top-management support, project team competence, the presence of a project champion; good business requirement and data analysis, interdepartmental co-operation, vendors' support and partnership, user training, and change management. Success factors may be related to different dimensions and defined according to different perspectives. In the analysis of this case, we use four perspectives: content of the change, internal context, external context, and process (Pettigrew, 1985; Pettigrew, Whipp, & Rosenfeld, 1989).

Project Genesis was justified because of increasing waiting time and lack of integration between software systems for registration and titles and driver's license information system, resulting in data duplication. The level of user information satisfaction with the legacy system was low. However, the project was rather ambitious. It not only required a new computer-based information system but also significant changes in the organizational structure, by merging the two existing divisions. From a content perspective, one may argue that the project had a high risk of failure.

Evidence from the data suggests that the process of organizational change and change management was not properly conducted. Several organizational requirements were not fully identified, later, leading to software errors. Since users did not have proper training on how to use the software, this problem became more serious. Most training sessions were conducted using an incomplete software release, which would later be developed.

The internal context of the organization was not the best to enable a new and significant information systems' project. Some users had a low level of computer literacy. There was also lack of project management skills and the roles of people in the project were not clear. The system had too many bugs but there were also political pressures from the external context of the organization to go live. Abandoning the system was not an option. From the perspective of the Governor of Nevada, abandoning the system would have been the worst choice, since tax payers would probably have questioned why the investment was done in the first place. Furthermore, neither Nevada DMV nor the consultancy firms involved in the project were interested in assuming project failure.

In the middle of 2000, the Department of Information Technology hired Analysts International Corporation to conduct a post-implementation review of project Genesis. The scope of the report was for the period up through Phase 2. The consultants concluded that the project was implemented on time and within budget but that it failed to meet customer needs. In addition, the report included some key concerns: training, quality assurance, change management, performance measures, and go-live decision. The report also had some recommendations including the re-engineering of the Genesis application. Consultants suggested that business processes needed to be redesigned with focus on customer needs.

On January 9, 2008 Nevada approved a $29 million contract extension with Digimarc for a high security driver license system. As per the contract, Digimarc is to enhance the license production system to include biometric information. The Director of Nevada DMV, Ginny Lewis, claims that such a move will position Nevada for "REAL ID Act compliance". Clearly, the external context is imposing a new set of requirements for system integration. There is hope however, that the lessons from past failures would have been learnt for future success.

5. Conclusion

Although many problems were found, in the end, Genesis was reported to be on budget and on track. In fact, lines at the DMV were no worse off than any other State. The DMV's IT staff strongly believed that Genesis has been a major success mainly due to the fact that there is room for them to build on the system. Alternative technologies are ahead of the original schedule. The DMV continues to provide consumers with new ways of utilizing its services. All this has been made possible by Genesis. However, if asked in 1999, any motorist who would be waiting for 8 h on a queue would probably tell that the new computer system was a big failure. This case supports the perspective that information systems success is a subjective concept, depending on users' expectations, perspectives, and interests.

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References

Caldeira, M., & Ward, J. (2003). Using resource-based theory to understand the successful adoption and use of information systems and technology in manufacturing small and medium-sized enterprises. *European Journal of Information Systems*, *12*(2), 127–141.

DeLone, W., & McLean, E. (1992). Information systems success: The quest for the dependent variable. *Information Systems Research*, *3*(1), 60–95.

DeLone, W., & McLean, E. (2003). The DeLone and McLean model of information systems success: A ten-year update. *Journal of Management Information Systems*, *19*(4), 9–30.

Flowers, S. (1996). *Software failure: Management failure*. Chichester: Wiley & Sons.

Holland, C., & Light, B. (1999). Critical success factors model for ERP implementation. *IEEE Software*, *16*(3), 30–36.

Melone, N. (1990). A theoretical assessment of the use-satisfaction construct in information systems research. *Management Science*, *36*(1), 76–91.

Pettigrew, A. (1985). Context and action in the transformation of the firm. *Journal of Management Studies*, *24*(6), 649–670.

Pettigrew, A., Whipp, R., & Rosenfeld, R. (1989). Competitiveness and the management of strategic change processes. In A. Francis, & P. Tharakan (Eds.), *The competitiveness of the European industry* (pp. 111–136). London: Routledge.

Somers, T., & Nelson, K. (2004). A taxonomy of players and activities across the ERP project life cycle. *Information & Management*, *41*(3), 257–278.

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