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The SILVER Spark for Nevada

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The **SILVER Spark** for Nevada



Sustainable Innovation Leading a Vital Economic Renaissance

A Report to The



March 2011



Purpose

It's no secret that the national economic downturn has hit Nevada hard - and that Nevada desperately needs to create more jobs.

The Nevada Commission on Economic Development (NCED) is tasked with doing that for Nevadans, and it directed the Nevada Institute of Renewable Energy Commercialization (NIREC) to complete a review of the current Nevada innovation and commercialization ecosystem and then recommend changes to help accelerate the creation of new technology-based jobs within the State.

Economic growth is increasingly dependent upon the transition of ideas from public and private sector research to the market place, thereby creating new enterprises and accompanying employment around clusters of demonstrated competencies. The lack of a robust innovation and commercialization ecosystem leaves a state behind the curve in a knowledge-based economy, and Nevada is clearly struggling to compete both nationally and globally for new economy jobs.

The 'SILVER' Spark is designed to drive more innovation in Nevada, enhance the commercialization ecosystem and accelerate company formation. All of which is intended specifically to further diversify the State's economy and create new jobs for Nevadans. Failure to do so will relegate the State to a less-than-desirable future.

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P R E F A C E

Nevada. A State of stark contrasts, with historic booms and devastating busts experienced throughout its modern history. A State frequently forced to reinvent itself as ever-evolving circumstances have demanded. A State that has been driven to the edge time after time and, yet again and again, has managed to discover another way to prosper. A State that now finds itself in a precarious position as the “Great Recession” hit it harder than any other and has left it struggling to recover.

We all know the statistics. In many cases, Nevada often ranks highest where one wants to be ranked low, and it ranks lowest where one wants to be ranked high. And amongst its immediate neighbors, Arizona, California, Idaho, Oregon and Utah, and its western brethren, Colorado, Montana, New Mexico and Wyoming, it is struggling once again to redefine itself.

Dwelling on the negatives, however, ignores the abundance of positives. The bright lights, the glitz and the sounds of money changing hands may dominate the impressions of many, but it overlooks an important reality. There is more to Nevada than most may realize. There is admittedly still gold in the hills, but there is also economic potential in aggressively mining and processing its intellectual property into new technology-based enterprises.

As you will conclude by reading the following report, Nevada can successfully build a globally-competitive economic engine based on innovation and entrepreneurship through the commercialization of research, discovery, and development. It will, however, require changes in how the State operates, by uniting the many competing visions, missions and goals found statewide. Although the seventh largest state geographically, Nevada is only the thirty-fifth most populous state in the Union. So it must also find a unique way to focus its admittedly stretched resources on a strategic set of priorities to successfully diversify its economy.

The question being asked by Nevadan’s across the state is whether we are ready to begin building yet another new chapter in Nevada’s storied history. As stated in the Nevada Vision Stakeholder Group (NVSG) report released in September 2010: *“While Nevada’s challenges were put into sharper focus by the recession, these issues have been known and discussed for many years.”*

Innovation efforts in Nevada still remain fractured and underfunded. Numerous organizations throughout the State are directly and indirectly involved in innovation. However, there are few physical “Centers of Excellence” for these organizations to collaborate in either northern or southern Nevada let alone within any of the rural counties. With some exception, current efforts at leveraging innovation into sustainable enterprises are by and large chaotic, with results being driven more by serendipity than design.



The plethora of well-intentioned organizations throughout Nevada are typically resource-constrained and unable to singularly solve the “wicked problems” that can accelerate economic transformation through innovation. Most struggle even in the best of times simply to generate sustainable revenue. Limited operating budgets result in a scarcity of dollars to invest in badly needed programs. While Nevada is, by some, considered a place for innovation and entrepreneurial activities, it cannot legitimately lay claim to such a brand today, especially as it pertains to the creation of high-tech startups. This reality must change for Nevada to compete in a globally competitive knowledge-based economy.

As the NVSG report concluded: *“Tight state and local budgets notwithstanding, now is the time to make the structural changes and investments Nevada needs, lest its obstacles become insurmountable in the years ahead.”* The following report suggests that the window of opportunity is fleeting, likely to be only a few years and certainly not decades.

The ‘SILVER’ Spark proposes an approach to do exactly what so many across the State have suggested must be done for so long—transform the State’s legacy economy and create new-economy jobs. It advocates the application of sustainable innovation to lead a vital economic renaissance through the following three major transformational actions:

- Drive more public and private innovation in the State.
- Improve the State-wide commercialization ecosystem.
- Accelerate entrepreneurial activity throughout Nevada.

Examples of successful transformational programs abound. Other states such as Arizona, Colorado, Georgia, Kansas, Michigan, Montana, New Mexico, Ohio, Pennsylvania, Utah and Texas have all driven major changes to their economies through programmatic investments in innovation, commercialization, and entrepreneurship. However, another state’s successful “big idea” will not necessarily be equally successful in Nevada.

Nevada is uniquely Nevadan.

From its world-class gaming facilities to its innovative laboratories, Nevada is still a place where dreams can become reality. Nevada itself is collectively a gigantic open source laboratory. It is a place where a scientific theory, an educated hypothesis or sometimes little more than conjecture can change everything in a spark.

It is time for Nevada to reclaim its innovation brand!



EXECUTIVE SUMMARY

Background

Nevada's economy has gone from boom to bust in the past decade, and it remains in a struggle to recover from the Great Recession. Key findings from the myriad of previous reports, data analysis, and ongoing discussions all lead to the same conclusion: **ensuring Nevada's long-term economic competitiveness requires a more strategic approach to the State's investment in people, infrastructure and economic opportunity.**

Furthermore, organizing economic growth prospects by identifiable key commercialization strengths must become an adopted message and proactive agenda for elected officials and a broad range of private sector collaborators, leaders, investors and partners.

What is the greatest threat facing Nevadans and their economic competitiveness in 2011? The answer: ensuring opportunities for employment and income growth based on the strength of their skills, access to critical support infrastructure and a hospitable climate for 21st century businesses (both existing and new) to flourish. However, on-going fiscal threats to improving economic development, education and workforce infrastructure severely challenge these aspirations.

From the work completed by the Battelle Memorial Institute in 2000 to the Nevada 2.0 Conference in January 2011, the accumulation of data and facts discussed in Section III and listed in Appendix F have proven that Nevada must change its recipe for how it accumulates and invests its limited financial and human capital. Economic, societal and technological turbulence is now a norm in the global economy; building a resilient, offensive, growth-oriented platform and sustainable implementation plan is no longer an option for Nevada - it is now a necessity.

A general proposition for sustainable innovation to lead a vital economic renaissance (the 'SILVER' Spark) is simple: Nevada cannot invest in those opportunities that will make it nationally and globally competitive while continuing to invest in non-productive programs, under-funding critical initiatives, and assuming traditional, legacy business

sectors are sufficient to ensure the prosperity of its citizens. During previous good times there were numerous opportunities to transform Nevada's economy; during the current fiscal crisis pursuing these opportunities becomes even more relevant and vital to the future economic success of Nevada.

Scope

The Nevada Institute for Renewable Energy Commercialization (NIREC) was directed by the Nevada Commission on Economic Development (NCED) in November, 2010 to complete an assessment of the innovation and commercialization ecosystem in Nevada and recommend improvements designed to accelerate job creation.

The 'SILVER' Spark is derived from completing an assessment of Nevada's capabilities to produce intellectual property, its physical assets and commercialization support infrastructure, along with studying relevant benchmarks and best practices in support of accelerating innovation, commercialization and entrepreneurship across the U.S. and abroad.

To further support this effort, NIREC retained the services of Regionnovate LLC, based on the body of work conducted by its Principal, Richard Seline, in the states of Alabama, Arizona, Florida, Iowa, Kansas, Pennsylvania, Tennessee, Texas, Utah and other regions in the U.S. over the past decade. Through Regionnovate's participation in this effort, NIREC has endeavored to capture and present an assessment of Nevada's current and future competitiveness for economic growth through increased innovation and the commercialization of ideas, technologies, products, and services.

The 'SILVER' Spark was accordingly developed based on the following methodology:

1. Capture and assessment of all previous reports on Nevada's economic, demographic, fiscal, policy-related and regional industry sector



investments, programs and initiatives, including determination of progress based on recommendations from each report; and

2. High-level analysis of Nevada’s current industry clusters as well as growth-oriented innovation strategies in support of new product, service and intellectual property development across academic and corporate interests; and
3. Asset mapping of unique infrastructure, facilities, institutions, operations and programs that – if properly coordinated and networked – could greatly accelerate the achievement of results derived from the ‘SILVER’ Spark; and
4. Identification of clusters of competency, knowledge and skills that distinguish Nevada from other locations, leading to a finite list of specific targets of opportunity based upon the Evolution of Economic Development Strategies for Nevada State’s competitive advantages; and
5. Capture and assessment of best practices, benchmarked programs and competitor state approaches to economic development, innovation capacity building, research and commercialization, incentives and investments along with structural responses to barriers and limitations.

This assessment has also relied upon conversations, interviews and feedback from a number of Nevada’s private and public sector thought leaders, to gain vital insights, subject matter expertise and

leadership expectations for advancing recommendations.

The ‘SILVER’ Spark seeks to lay a foundation for a transformative innovation-based and commercialization-intensive economic development “game-changer” for Nevadans and their future. With the recent Nevada 2.0 Conference and subsequent focus on relevant state innovation and commercialization models such as Utah’s USTAR program, the ‘SILVER’ Spark provides some figurative rocket fuel and navigational tools to enable “lift-off” on the journey to a more prosperous economic future for Nevada.

However, the ‘SILVER’ Spark is *not all-encompassing* and is therefore not meant to singularly drive Nevada’s entire economic development strategy.

Traditional economic development strategies associated with marketing to, and attracting large businesses outside Nevada, for example, remain outside the scope of this study. A solid strategy to increase the production or acquisition of intellectual property resulting in organically grown technology-based startups, however, will only enhance traditional economic development practices.

No doubt, however, global forces have resulted in a shift in economic development practices in the U.S. to a greater reliance on a state or region’s capacity to innovate and commercialize new products and services based upon intellectual property either generated within or acquired from public or private sector R & D operations. The figure below depicts this evolution in economic development.





To Where We Must Be by 2015
for an Innovative, Competitive Nevada...

<p>Encouraging 'open source innovation' (accessibility to the best minds, entrepreneurs, resources) and applied knowledge as a competitive advantage within the Intermountain West region AND as an export to national and global markets.</p>	<p>Creating global networks of innovation and becoming a hub or node of unique knowledge, know-how, and technological competency, leading to market leadership in core product discovery, development and deployment of targeted opportunities</p>
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Leading to A Broad Portfolio of
Commercialization Outcomes, Jobs, and Growth

Given the numerous reports and analyses that have been produced in Nevada over the past ten or more years, we have paid careful attention not to repeat the voluminous amount of prior work and assessment. Rather the 'SILVER' Spark frames the critical actions and implementation steps that must now be advanced for an innovative and competitive Nevada to exist in the near-term.

Commercialization is discussed in more detail in Section IV, but in its broadest term it is the placing of a strategic bet on the knowledge economy and the vital elements of the innovation ecosystem throughout Nevada by internal and external investors—both in the public and private sectors—to accelerate economic diversification.

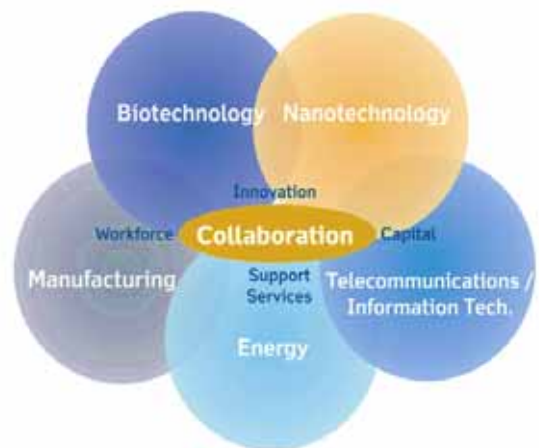
Innovation and Commercialization

In assessing Nevada's innovation strengths, counting the number of patents produced is far less important than determining the recipients and subsequent use of such intellectual property. In reviewing several Nevada System of Higher Education (NSHE) reports and briefing materials, the current aggregate academic production of intellectual property—disclosures, patents, and licensing revenues—is presently insufficient in and of itself to support a commercialization culture.

Consequently, focusing exclusively on the academic research enterprise in Nevada to spur innovation and commercialization would be a mistake. Forming collaborations with Federal and private sector chief science, chief research, and chief technology officers both inside and outside Nevada will serve to jump-start the state's commercialization engines.

Clusters of Knowledge

What has driven the so-called knowledge economy is the alignment and blurring of the lines across disciplines, technologies and even the industries that have been the staples of the U.S. and global business landscape during the 20th century. As discussed in





Section VI and explored further in Appendix B, elements of scientific and technological ‘threads’ now blend to foster new products, services, and occupations on a daily basis.

These fast-moving trends are causing constant disruptions to business models. As an example, biotechnology and energy, nanotechnology and manufacturing are cross-fertilizing in research laboratories and on product development whiteboards around the world. In promoting a Nevada technology-based economic development strategy, we must assess the State’s assets based on their potential for driving value-added collaboration rather than through the traditional stovepipes.

Simply, Nevada has an opportunity to advance its competitiveness by adopting a multi-faceted innovation-driven and commercialization-intensive economic recovery by focusing on those opportunities that leverage several disciplines and market-needs.

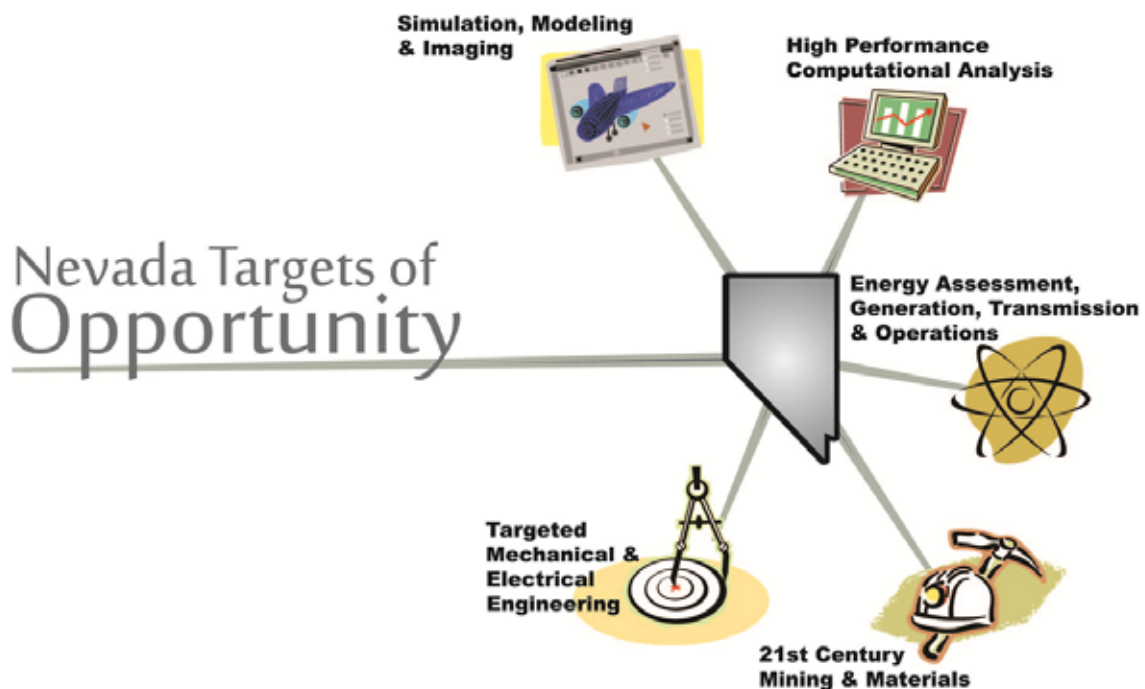
Targets of Opportunity

Several different data sources describing current industrial activity, employment, and occupational trends were used in developing the recommendations below. Appendix B includes a number of charts depicting occupation and workforce trends in Nevada. In addition, we reviewed investment activity by academic, business

and government interests in Nevada against the backdrop of global trends and forecasts. Finally, we also examined the output from research, development, applied technologies and industry operations, identifying current and emerging intellectual property and commercialization potential for Nevada.

In our analysis, we examined not only the internal asset base and existing intellectual capital within and around these targets, but sought to define national and global market potential including firms, companies, and industry partners to recruit to Nevada. This approach seeks to form a ‘value chain’ of economic and workforce development activities necessary to strengthen current capacities as well as promote and attract the world’s best talents and enterprises to our State because we have organized the commercialization intensity for profitability and immediate results.

There are obvious linkages, overlap, and collaboration among the five targets: any number of people, assets, and facilities identified could serve the requirements needed to accelerate commercialization outcomes. That is the simplicity of this approach; form interchangeable partnerships, relationships, and networks that respond to market demand and commercial expectation as required to either start new firms or assist global corporations remain competitive.





The analysis of “Nevada’s Research and IP Portfolio” generated five distinct targets of opportunity which are discussed in considerably more detail in Section VII, including:

1. Simulation, Modeling & Imaging



Description:

Defense and gaming industries have conducted on-going research, filed for patent rights and assignment, and required continuous product development for both assisting soldiers on the battlefield and in driving billions of dollars in gaming receipts. These demands are expected to rise with additional uses of drones and other unmanned aircraft as well as expanded gaming response to competition and global consumer demand.

New Opportunities:

By applying simulation, modeling and imaging to environmental and energy related assessments, reducing theft and fraud through facial recognition, and diagnosing disease and human structure, Nevada is positioned to compete globally.

2. High Performance Computational Analysis



Description:

With the commitment of SWITCH, located in the south, Nevada has attracted the next generation of high through-put computing and information services bandwidth that has historically existed to the sole benefit of the U.S. Departments of Defense and Energy. Based on Nevada’s role in critical test-evaluation programs for weapons systems, reduced nuclear arsenals, and on-going monitoring of operations requiring massive computational analytics, the State has significant depth in the skills and competencies for emerging applications.

New Opportunities:

New demands for product design, advanced and complex manufacturing, toxic waste storage and/or reuse, and related scenarios in live demonstrations and field tests can be scaled in Nevada immediately and successfully. The formation of contract testing and evaluation operations in partnership with industry and government customers can take advantage of Nevada’s unique capabilities.

3. Targeted Mechanical & Electrical Engineering



Description:

Industry on the whole, the defense community, and the overall mining and energy sectors have amassed significant skills and competencies in mechanical and electrical engineering for decades throughout Nevada. And yet, overlooked are the engineers that design and launch the most widely regarded entertainment venues in the world for the staging of multi-million dollar performances. The technologies and knowledge behind compression valves and fluid power units to lift tons of heavy machinery in the geothermal fields of Northern Nevada are similar to the staging that lifts actors and acrobats in Cirque du Soleil’s KA.

New Opportunities:

Engineering is the underpinning to the innovation and commercialization strategies of any new product in the marketplace today. The majority of these skills and competencies are found not only on the state’s academic campuses, but, in the military, energy-related, and entertainment facilities where critical materials, filters, and event staging require constant upgrades, maintenance, and innovative techniques for the safety of personnel and the reliable operation of sophisticated facilities and equipment.



4. Energy Assessment, Generation, Transmission & Operations



Description:

The capacity for Nevada to be a net-exporter of energy has already been proven through numerous U.S. Department of Energy reports and analyses conducted by nationally distinguished federal laboratories in Berkeley, Boulder and Pittsburgh, for example, and through the U.S. Department of Energy's analyses placing the State in the forefront of geothermal and solar deployment potential. The California and the Intermountain West region look to Nevada as a significant enabler in developing the electric generation and transmission capacity to meet current and future energy demand.

New Opportunities:

From its important role in enabling the harnessing of nuclear energy for military use, Nevada has a rich and robust capacity to examine and assess energy-related generation and operations through both basic and applied research, as well as to define the technological solutions required to deploy and manage alternative sources of energy beyond fossil fuels. These technologies include a wide range of products and services to convert the State's vast solar, geothermal, and to a lesser degree, wind-sourced power into traditional energy grids and evolving 'smart grids,' along with technology solutions for control and monitoring of homes and offices to improve energy efficiency.



5. 21st Century Mining & Materials

Description:

The oldest industrial sector of Nevada cannot be overlooked for its continued importance to the economy and its global reach of expertise and knowledge—mining and extraction of minerals. Though often focused on gold, silver and copper, the

Nevada mining sector has identified a number of base minerals for additional benefit to manufacturing, health-care, and materials. These include diatomite, gypsum, lithium, magnesia and zinc. Millions of acres of open land provide the 'laboratory' for locating processing facilities along with experimentation and testing of minerals for new applications.

New Opportunities:

Base mineral research has been somewhat overshadowed by the focus on renewable and alternative energy in Nevada, though research institutions both within and outside Nevada have a positive outlook on the next generation of mineral uses, and therefore a renewed perspective on Nevada's potential contributions. The use of advanced materials for electronics, consumer goods, and packaging have begun to accelerate as have the realities of minerals in diet and nutrition strategies for both human and animal consumption.

We believe the foregoing five unique competitive advantages—targets of opportunity—described above, organized as centers of innovation and commercialization excellence, could spark immediate and longer-term job creation, investment, and new revenues for both public and private-sector interests.

Recommendations

There is admittedly much to be praised about the innovation-driven and commercialization-intensive successes from other states. What cannot be taken for granted, however, is that many of these programs were built upon significantly higher levels of academic research and development spending and greater public and private investment capacities than the current Nevada landscape affords.

We therefore caution the State from attempting to replicate any other state's economic transformation model without addressing the fundamental and underlying challenges, barriers, and limitations specific to Nevada. To go from 'zero to sixty' through a whole-cloth adoption of the Georgia or Utah models, for example, is likely to be fraught with unintended consequences and unmet expectations.

Nevertheless, as Governor Brian Sandoval stated in his State of the State address on January 24, 2011,



“Innovation will drive tomorrow’s economy, and so it must drive our decision-making as we rebuild our economic development infrastructure.”

The challenge for Nevada is how best to deliver against three enabling objectives after giving realistic consideration to its related opportunities and constraints, including:

- Driving more public and private innovation in the State.
- Improving the State-wide commercialization ecosystem.
- Accelerating entrepreneurial activity throughout the Nevada.

Literally billions of dollars of Federal research funds as detailed in Appendix C, along with additional monies from other public and private sector entities, have shaped the five targets of opportunity over the past ten years. These are the seeds that have already been planted throughout Nevada. Successfully cultivating these seeds and harvesting the benefits will require significantly more collaboration than ever before seen in Nevada. The systematic sharing of information and expertise across numerous boundaries will be critical to the success of the ‘SILVER’ Spark.

Collaboration at this level can be achieved by actively engaging and enabling five different categories of organizations in a statewide innovation ecosystem, including:

- Existing Federal, private-sector and academic research institutions and facilities across the State
- A newly created statewide innovation intermediary
- The statewide risk capital network
- All of the other relevant public and private-sector organizations with a presence in the State
- The economic development organizations throughout the State

Nevada is uniquely positioned to become an ‘Open Source Innovation State’ by more closely connecting its statewide innovation and commercialization assets around the five targets of opportunity and actively engaging with a wider range of relevant

public and private sector entities to accelerate the formation of new companies and create jobs for Nevadans. If we choose to capitalize on it, this is the moment to create nothing less than a 21st century engine for change which is built to operate like a real-time incubator of ideas and new entrepreneurial ventures across the entire State.

Sparking Lift-off

The ‘SILVER’ Spark will lead to a vital economic renaissance in Nevada over a period of time by essentially repositioning Nevada as a reenergized hub of innovation and commercialization. To spark lift-off now and begin the journey to a more diversified, innovation-based economy, the following seven immediate actions are recommended:

1. *Provide state budgetary support to retain existing intellectual property producers within the Nevada System of Higher Education (NSHE) as well as to recruit faculty luminaries to vastly increase the production of commercializable research.*
2. *Appoint and sponsor a public-private “Innovation Intermediary” that will develop, launch and manage a statewide “Innovation Network” to coordinate and leverage the capabilities of the many individuals and organizations—including public and private educational institutions such as Sierra Nevada College—working in the State to accelerate the commercialization of ideas into sustainable enterprises.*
3. *Exploit short-term opportunities within industry and Federal government applied research laboratories (especially the Department of Defense) to accelerate existing innovations and competencies into new commercializable products and services.*
4. *Increase the economic development spend on attracting intellectual property, risk capital and management talent into Nevada, especially from California, by better leveraging and exploiting Nevada’s competencies, supply chains and market opportunities.*
5. *Pursue the development and support of physical or virtual technology “Accelerators” within “Centers of Innovation and Commercialization”*



located throughout the State to facilitate innovation, commercialization, company formation and the profitable growth of new industries.

6. *Support the attraction of private sector risk capital (including seed, venture and other forms of private equity) through the creation of one or more State—seeded financing vehicles. Recognizing current constitutional constraints, pursue alternative funding sources (outside of the State’s General Fund) such as the Nevada Public Employees Retirement System, Permanent School Fund, and the Unclaimed Property Fund.*
7. *Support the attraction of Federal, private sector, and philanthropic research and development dollars through the formation of a research leveraging program to organize, draft, apply, and provide required cost-share funds to win these programmatic dollars throughout the State.*

The aspiration of the foregoing is to position Nevada as the go-to location for innovative startups, as well as for any ensuing relocation and expansion activity of companies and consortium seeking to leverage our plentiful assets and resources. Further encouraging the Governor, State Administrators and Legislators to enact the policies which will underpin the above seven (7) recommendations thereby transforming the economic model of the State, will spark the growth engines for investment and employment by branding Nevada as the location of choice for innovation and commercialization within the five targets of opportunity and beyond.

Conclusion

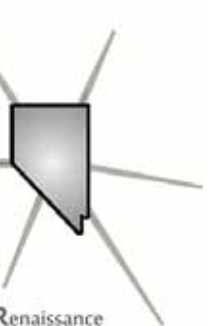
Nevada has a challenge. It needs to create more jobs, and preferably new economy jobs that can offer Nevadans higher salaries and better benefits. Jobs that generate incomes sufficient for Nevadans to buy new houses and cars, shop at local stores and eat at local restaurants, use local service providers, help ensure that families can send their children to good schools and colleges and save for retirement. Jobs that generate the tax revenues desperately needed to support State and local government.

As U.S. Senator Harry Reid stated in his address to a joint session of the Nevada Legislature on February 22, 2011:

“I didn’t come here to talk about the past ... I’m here to talk about our future: how we will move Nevada forward. How we will seize this unique, rare and critical opportunity to lead not just the nation’s economy, but the world’s.” He further added that *“the question is whether we will direct our destiny, or forfeit our future ... The day to grow new jobs, attract new business, raise a strong generation and breathe life into our economy is today, if we take it”*.

There is admittedly no silver bullet to accomplish what Senator Reid has suggested, but there is a ‘SILVER’ Spark. A pragmatic initiative in which sustainable innovation can lead a vital economic renaissance in Nevada by better leveraging an impressive array of assets positioned throughout the State. The seeds have already been planted for a better future throughout Nevada. We must, however, seize the moment and muster the political will to take the immediate steps recommended in the ‘SILVER’ Spark to ignite “lift-off” and begin the journey to a more diversified, innovation-based economy.

The
SILVER Spark
for Nevada



Sustainable Innovation Leading a Vital Economic Renaissance

That being said, innovation is not about technologies or products, not just cool ideas and awestruck bumper-stickers. Innovation is about unleashing the capabilities of Nevadans to solve national and global problems, to create a set of solutions for society’s greatest challenges in health and energy, for instance. Commercialization is the means to have any Nevadan link their ideas to markets, to connect with another Nevadan to form a company that could be purchased outright by a global corporation, or to leverage Federal investments at military bases to the



needs of industries seeking to find something that will improve their margins and profitability.

Innovation and commercialization, as outlined in the 'SILVER' Spark, has the promise to accelerate national and even global companies' profit growth by tapping Nevada's best minds, teams and infrastructure.

From previous reports, analyses, and forums, a small band of leaders have already defined the need to engage a new form of economic development strategy—one that is based increasingly on knowledge, innovation and the commercialization of ideas, people, products, and services. We further recognize that there are several important and significant initiatives and projects underway at both the State and local levels throughout Nevada. With the adoption of the innovation and commercialization strategies as described in the 'SILVER' Spark, there is an opportunity to connect the entire range of interests and participants across the State into a strategic discussion regarding assets, investments and a portfolio of outcomes.

The 'SILVER' Spark seeks to focus this discussion on a set of "commercializable" opportunities and the recommended actions that acknowledge where Nevada has been, where it is currently, and where it must give attention in the future to be a competitive economic engine for all Nevadans. No other region,

state, or country is waiting for Nevada. The advances in competitiveness through scientific, technological and business transformation have created a constant form of turbulence in the economic cycles of profitability and prosperity. However, if Nevadans focus on those actions and implementation steps suggested herein, such turbulence can be leveraged into opportunity.

As shown throughout this report, Nevada has the robust individuals, institutions and assets with significant capacities to innovate. And yet we have focused for far too long on the traditional application of economic and workforce development practices. We have the capacities to network our 'brain-power' if we will only look through a new lens and perspective about what Nevada can truly be in comparison to the rest of the nation. Simply, it is time for Nevadans to design, implement and manage their own future rather than letting the future happen to them.

As Governor Sandoval concluded in his State of the State address,

"We are leading the Nevada family onto a new path, and I submit that it is one of progress and ultimate prosperity. If we have the courage to make the tough decisions, and there will be many, we will succeed."



R E P O R T

Section I: A New Sense of Urgency

Nevada's gaming-hospitality-mining economy enabled an economic marvel for the State over several decades. However, as proven during this most recent recession, Nevada cannot rely primarily on a consumption-oriented economy to prosper in a highly competitive global marketplace. Nevada must therefore continue to adapt through value-added innovation, thereby serving the long-term prosperity of both individuals and businesses across Nevada and the nation as a whole.

While Nevada is often considered a place for innovation and entrepreneurial activities, it no longer can claim such a brand, especially as it relates to the creation of high-tech startups. Through the lens of external rankings and internal indicators, the underlying data speak for a renewed sense of urgency - and a renewed commitment to focus attention, resources and leadership from all of Nevada to ensure national and global competitiveness. Today's uncertainty in private and public revenue generation requires attention to leveraging resources and efficiencies in times of a permanent economic and societal 'turbulence'.

Aligning Nevada's growth prospects with a stable and sustainable innovation-based and commercialization-driven model is critical.

Because of disruptive technological and manufacturing advancements, Nevada's industries and sectors will require greater differentiation of products and services in the future to ensure competitiveness. Given Nevada's starting position, it is important to recognize that the best minds and brains do not have to be resident within Nevada to win economically. Increasing networks of regional, national and global relationships among Nevadans and the outside world is vital to generating ideas, products, capital and solutions into and among Nevada's existing companies, technology communities of practice and research institutions.

Coordinated actions among public sector, private sector and non-profit public-private partnerships are vital to Nevada's transformational efforts. Removing barriers and eliminating stovepipes - especially

across governmental agencies, departments and programs - is critical to Nevada's success in attracting and nurturing the 21st Century private sector businesses required to restart Nevada's economic engine. Furthermore, data collection, analysis and knowledge-sharing are paramount to anticipating the future rather than continually being reactive.

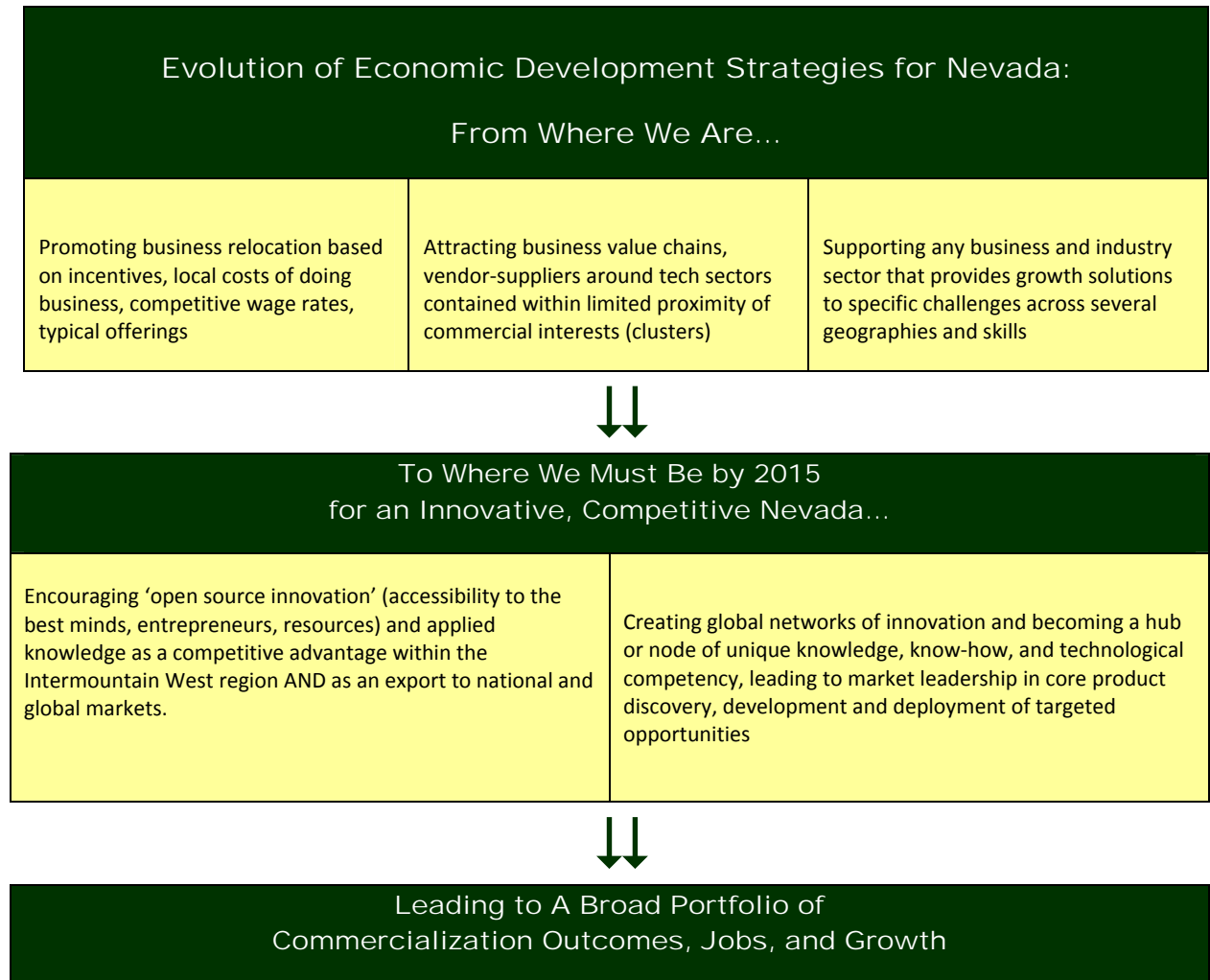
Another Nevada quandary is the State's very ownership of its destiny - which is tied to some degree by decision-makers in other locations - especially Washington D.C. What is clear in every previous report is the desire to determine the destiny of current and future generations by defining economic growth that is more internally generated rather than bound to external forces. Nevada must no longer serve as a 'territory' of the United States, but come into its own as a full-fledged competitive economic engine based on innovation through the commercialization of research, discovery and development.

The State's public and private sector leadership must be committed to 'change' as it relates to the delivery of research, innovation and commercialization outcomes. Those states and regions that have progressed in the evolution of their economic strategies did so based on academic, business, civic, entrepreneurial and government leadership driving an agenda on specific steps and initiatives, and a demand for performance and accountability for results.

Although public sector support is necessary, that alone is insufficient. **Now is the time for the private sector to lead and drive the agenda, goals, and implementation.** Just as Greater San Diego's real estate and financial services leaders did when nearly 70,000 defense jobs were cut over an 18-month period in the late 1980s and early 1990s, the civic leadership of Nevada must drive the evolutionary steps in economic development depicted in Figure 1, below.



Figure 1: Evolution in the Role of Economic Development



Nevada is positioned to move from a more traditional approach of economic development to one that is driven by innovation, applied knowledge and global networks based on specific competitive advantages. In light of the on-going economic turbulence facing the nation and in turn Nevada,

reassessing how the near-term economic development infrastructure, strategies, policies, and operations meet the test of the global competitive marketplace is vital to successfully implementing the 'SILVER' Spark's recommendations and achieving its desired objectives.



Section II: Scope of the Study

The Nevada Institute for Renewable Energy Commercialization (NIREC) was directed by the Nevada Commission on Economic Development (NCED) in November, 2010 to complete an assessment of the commercialization ecosystem in Nevada and recommend improvements designed to accelerate job creation.

The 'SILVER' Spark is derived from completing this assessment of Nevada's intellectual property productive capability, physical assets and commercialization support infrastructure, along with studying relevant benchmarks and best practices in support of accelerating innovation, commercialization and entrepreneurship across the U.S. and abroad.

The 'SILVER' Spark was accordingly developed based on the following methodology:

1. Capture and assessment of all previous reports on Nevada's economic, demographic, fiscal, policy-related, and regional industry sector investments, programs, and initiatives, including determination of progress based on recommendations from each report; and
2. High-level analysis of Nevada's current industry clusters as well as growth-oriented innovation strategies in support of new product, service and intellectual property development across academic and corporate interests; and
3. Asset mapping of unique infrastructure, facilities, institutions, operations, and programs that - if properly coordinated and networked - could greatly accelerate the achievement of results derived from the 'SILVER' Spark; and
4. Identification of clusters of competency, knowledge, and skills that distinguish Nevada from other locations, leading to finite list of specific targets of opportunity based upon the State's competitive advantages; and
5. Capture and assessment of best practices, benchmarked programs, and competitor state approaches to economic development, innovation capacity building,

research and commercialization, incentives and investments, and structural responses to barriers and limitations.

This assessment has also relied upon conversations, interviews and feedback from a number of Nevada's private and public sector thought leaders, to gain vital insights, subject matter expertise and leadership expectations for advancing recommendations.

The 'SILVER' Spark seeks to lay a foundation for a transformative innovation-based and commercialization-driven economic development "game-changer" for Nevadans and their future. With the recent Nevada 2.0 Conference and subsequent focus on relevant state innovation and commercialization models such as Utah's USTAR program, the 'SILVER' Spark provides some figurative rocket fuel and navigational tools to enable "lift-off" on the journey to a more prosperous economic future for Nevada.

However, **the 'SILVER' Spark is not all-encompassing and is therefore not meant to singularly drive Nevada's entire economic development strategy.** Traditional economic development strategies associated with marketing to, and attracting large businesses outside Nevada or growing existing mature businesses within the state, for example, remain outside the scope of this study. A solid strategy to increase the production or acquisition of intellectual property resulting in organically grown innovation-based startups, however, will only enhance traditional economic development practices.

No doubt, however, global forces have resulted in a shift in economic development practices in the U.S. to a greater reliance on a state or region's capacity to innovate and commercialize new products and services based upon intellectual property either generated within or acquired from public or private sector R & D operations.



Section III: A Review of Prior Work

Efforts driven by many entities throughout the State have produced excellent reports and recommendations regarding paths to an alternative economic future. Smart-minds throughout Nevada have conducted a number of visioning and scenario-setting exercises as listed in Appendix F. Their work need not be repeated in this report. However, a number of common threads can be found in these prior reports and studies that are vital to make the case for a new model and transformation of Nevada's competitiveness tactics.

In its 2000 report, the Battelle Memorial Institute Technology Partnership team suggested thirteen specific recommendations for action, a number of which remain unfinished or awaiting launch to this day. For purposes of review, it is worth noting the required action and implementation steps were not put into motion nearly a decade ago - when the Nevada economy was much stronger. Figure 2, below, is an excerpt from the 2000 Battelle study.

Figure 2: Excerpt from 2000 Battelle Study

SIGNIFICANT AND CRITICAL ACTIONS FOR LONG-TERM SUCCESS

Among the thirty-two actions suggested, seven are seen as **critical** for the long-term success of the strategies and the overall plan. These highest priority items are:

- Conducting a Core Technology Competencies Analysis.
- Launching a Nevada Research Alliance.
- A renewed mission strategy for UNR and UNLV.
- Increasing public understanding of technology-based economic development and the New Economy.
- Increasing technology industry input to higher education programs.
- An entrepreneurial friendly system of statute and constitutional law.
- Creating a Silver State Technology Corporation.

Discussion has already begun on the implementation of several of these items. However, in most cases serious implementation actions have not commenced. A small number of these critical priority items, as well as some high priority actions, can achieve significant results over the next twelve months in terms of implementation. They are:

- Conducting a Core Technology Competencies Analysis.
- A renewed mission strategy for UNR and UNLV.
- Increasing public understanding of technology-based economic development and the New Economy.
- Increasing technology industry input to higher education programs.
- Technology Nevada branding and marketing.
- Creating a Silver State Technology Corporation.



Table 1: Summary of Prior Reports and Studies

Table 1 below is a non-exhaustive summary of prior data, research, analysis and on-going report preparation across the State on Nevada’s economic diversification agenda. We have highlighted these reports for their recommendations and application in developing the ‘SILVER’ Spark; they serve as basic “building blocks” on which to advance a strategic innovation and commercialization vision and are effectively integrated by reference and attribution.

Sample Materials and Reports Reviewed	Critical Finding/Recommendation	Application to the “SILVER Spark”
A Technology Strategy for Nevada; Technology Partnership Practice, Battelle Memorial Institute, December 2000	Identified several key strategies for increasing R&D activities and commercialization by specific sectors, clusters; outlined need for intermediary organizations and forums	Key Question: why nearly a decade later did Nevada leadership not implement many of these critical recommendations, and what compels current leaders to act in a fiscal crisis today? Answer: Job creation in Nevada is even more dependent upon commercialization of technology assets.
The State of the System: NSHE Plan for Nevada’s Colleges and Universities, September 2010	Significant decline in state (as well as slowing federal investment) in academic excellence will negatively impact future growth prospects; must identify a new model like USTAR	Through a coordination of effort among colleges and universities, an initiative like USTAR, Georgia Research Alliance, or similar is necessary to jump-start academic research and commercialization; however wholesale overlaying another model on the current Nevada landscape may not fix fundamental challenges and gaps
Reno2020; College for Regional Studies, College of Business, University of Nevada Reno, September 2010	Declines in education and research institution support forces declines in high-wage positions, intellectual power; “Nevada has a 19 th Century fiscal system layered on top of a 21 st century economy with significant rigidities and complexities”	Examination of Nevada’s fiscal, tax, regulatory policies limits its transition into a knowledge-based economy by focusing on a land or real-estate asset driven economy rather than one on brainpower, commercialization, growth companies, and innovation
Nevada New Workforce for Economic Prosperity: Strategic Plan Framework 2010-2014; DETR, January 2010	Build Capacity & Champions, Bust Silos, Develop and Implement Sector Strategies, Align Education & Training, Develop Nevada’s Competitive Advantage. “Competing in the new economy with a focus on industry clusters and sector strategies will require Nevada’s JobConnect system to shift from focusing on filling job vacancies to support sector strategies”	If there was a specific time for transforming the state public sector partnership, the Strategic Plan Framework outlines the underlying case for a Nevada Jobs Cabinet, as well as the reorganization of DETR and NCED into a powerful arrangement of common purpose.
Workforce Connects: People, Partnerships, Possibilities, Annual Report Project Year 2009	Improvement on the partnerships among key economic organizations and drivers is key to diversification of the Nevada economy	Focus on occupations, skills, and talent that serve an emerging high-wage economy; identify waivers or releases from federal and state limitations to act in a time of fiscal and economic crisis so as to innovate solutions within the boundaries of rules but without legal impediments.
Nevada’s Promise (Excellence, Rigor, and Equity) Report of the Blue Ribbon Task Force on Education Reform, November 2010	Key lessons and take-aways from Nevada’s application for a US Dept of Education Race to The Top grant	Several elements of the Nevada K-12 education system require alignment to high-wage, high-skilled technical positions. There are several academies and high school programs that have emerged across Nevada to serve as exemplars of new practices and approaches.
Mountain Monitor, Brookings Mountain West/UNLV, December 2010	“One year of Mountain Monitor benchmarking suggests that this growth can likely only be powered by a substantially retooled economic engine – one fueled much more than the last economy ever was by human capital, innovation and exports.”	Incremental change for the way Nevada responds to key challenges in its competitiveness will not produce immediate, nor long-term results for education, training, degree or certification production, and shift the human capital negative rankings for Nevada
Setting the Stage for Nevada: State of the Nevada Economy, Dr. Robert Lang, Director, Brookings Mountain West	Lack of Industrial Diversification, Highly Volatile Economy, Risky Reliance Upon Consumers, Increasing-Sustaining High Tech Employment, Low Percentage of Adults with Bachelor Degrees;	Focus on Digital Entertainment, Advanced Manufacturing, International Industries, Information Storage, Defense and Public Safety, and Biotech; Recommendation to negotiate the transfer of public land or enhanced partnership with Federal Government for use of public lands given the Federal government’s need for revenues and conversion of non-productive assets.
Economic Development in Nevada: A Review & Analysis; Glenn Christensen Chairman, Nevada Development Authority	Stable and diversified economy, competitive K-12 education system, an integrated research-oriented university system, research and development investment in emerging industries, relatively high quality of life including local access to quality medical care, competitive business cost structure, highly integrated and efficient transportation system, establish a Nevada World Trade Center and State International Trade and Diplomacy Office to connect businesses to global markets, Focus on Federal Government as a customer, partner	Focus on Renewable Energy, Transportation and Logistics, Health Care, Medical Tourism, Medical Information Technologies. Beyond the Hospitality and Gaming Sectors, Southern Nevada is poised to leverage access to new medical research in brain functionality, applied technologies in solar, and military/national security initiatives driven by the two largest federal funders of R&D (Departments of Defense and Energy)



Strategic Plan 2005: Nevada Site Office, National Nuclear Security Admin.	Transformation into an unique US Department of Energy testing, evaluation, process and management site for nuclear and other materials will serve multiple federal interests	The federal expenditure on NSO has only just begun to prove a highly competitive advantage to Nevada's emerging Targets of Opportunities as a viable defense, national security partnership unfolds for military and intelligence applications
Nevada System of Higher Education Renewable Energy Report Update, October 2010; Quarterly Progress Report – State of Project Objectives Nevada Renewable Energy Consortium	Several advanced research projects focused on testing products, services, ideas and tools for addressing geothermal, solar, and other alternative energy forms	The pipeline for converting these research projects into commercialization outcomes requires immediate address and translational market partnering for maximum benefit
Nellis Air Force Base Economic Impact Analysis FY 2009; Materials on Nellis Program Offices and Operations	The \$5.1 billion federal program budget is the largest in the State and is driving several unique technologies and applications for serving active military needs in the field and war theaters around the globe from Nevada	Leveraging the US Air Force Warfare Center, the Joint Unmanned Aircraft System Center of Excellence, the Marine Corp Warfighting Laboratory, and the Nellis Family Medicine Residency programs is a high priority for a 'Silver Spark' agenda. In turn, Defense Department programs and procurement can be leveraged immediately to foster new partnerships and job creation.
Regional Assets Report; Northern Nevada Development Authority, May 2006; Regional Economic Development Strategy, October 2006	Robust assets for niche manufacturing have evolved into a unique pattern of job growth and diversification, beyond just serving California markets	Northern Nevada has become a center for advanced manufacturing scenarios in key Target of Opportunity elements coupled with a focus on training (NAM DreamIt Do It Program)
Nevada Development Authority, Economic Diversification Quarterly Reports – 2009-2010	Year on year analysis suggests that Diversification must continue to receive greater attention from public and private sector interests around key assets	The need for on-going regional metrics and indicators to monitor response to investments and 'Silver Spark' report recommended actions
Nevada Vision Stakeholder Group, 2010	Facing the Future elements across Economic, Transportation, Education, Health & Well-Being, and Public Safety details several strategies from 'Adoption of Information Technology Solutions' to 'Utilization of Federal Resources' – with vital indicators of current gaps and missed opportunities on which to focus	The Stakeholder Group has identified, and this analysis report has acknowledged, that a holistic approach to fundamentally transitioning Nevada into the 21 st Century will require full use of every existing and emerging asset in its arsenal. Prioritizing these recommendations, like the challenge in the Battelle 2000 Report is now vital to successfully moving innovation and commercialization into measurable job creation.

When assessing Nevada's capacity to innovate and commercialize from its inherent knowledge and know-how, we are concerned – as prior reports have stated - with the limited investment in and exploitation of the State's academic asset-base. In addition, the unique academic and business interests resident within or regularly passing through the State have not been fully leveraged. For example, the world comes to Nevada to participate in the largest consumer electronics show (CES) every year, and yet there is little evidence of lasting economic development spinoffs that may be possible through a well-organized and aggressive outreach effort to the thousands of important technology stakeholders and investors attending this massive Las Vegas event each year.

Over the past decade, Nevadans have sought to create, plan and organize solutions to several threats

to their economic prosperity through increased civic engagement and public-private partnerships. However, in their exuberance to address past and current challenges, the State has become fragmented with many agendas, missions, and ultimately competing goals. Such fragmentation has often led to miscommunications or lack of clarity about the desired end-point for the vital work and investment in long-term recommendations. To once again squander the renewed energies of academic, business, civic, entrepreneurial and government leaders would be an unfortunate waste of momentum and the opportunity to transform the State to a robust and resilient 21st century economy. It is incumbent upon those with responsibility and roles in commercialization, innovation, and economic development to increase our collaboration, alignment, and focus.



Section IV: Discussion of Important Terms

“Innovation”

In assessing Nevada’s innovation strengths, counting the number of patents is far less important than determining the recipients by company, organization and name. In reviewing several Nevada System of Higher Education (NSHE) reports and briefing materials, the current aggregate academic production of intellectual property - disclosures, patents, and licensing revenues - is presently insufficient in and of itself to support a commercialization culture. Therefore, the State must invest in driving a stronger pipeline of academic research output of patents and licensable

intellectual property as a key strategy in its effort to transform the economy.

However, focusing exclusively on the academic research enterprise to spur innovation and commercialization would be a mistake. Forming collaborations with Federal and private sector chief science, chief research, and chief technology officers both inside and outside Nevada will serve to jump-start the state’s commercialization engines. Table 2 below summarizes some representative sources of innovation in Nevada.

Table 2: Sources of Innovation

Patent Technology	Mechanical Engineering	Medical Products	Chemicals & Metals	Electric Power/ Electricity
Companies	Clean Fuels Technologies Sierra Engineering, Inc. R.P. Scherer Corp. Bentley Nevada Dreamwell Ltd. LSP Products Group Rocky Research Thomas & Betts Intl. AT&T Intellectual Property I/II LLP Ormat Technologies Manitowoc Foodservices Group Life Shield Engineered Services	Encore Medical Asset Corp. Impact Sports Technologies R.P. Scherer Technologies	Altair Nanomaterials Inc. ILLA International Inc. Sierra Sciences Inc. Valence Technologies Schering Plough Veterinary Corp. RAM Technologies	FCI Americas Technology Monster Power Thomas & Betts Intl. Berg Technologies CommScope Solutions Properties LLC DataFlow Intervoice Ltd. Valence Technologies AT&T Knowledge Ventures Intl Game Technologies BTR, Inc. Great Batch-Sierra
Institutions	Research Foundation		Research Foundation	Research Foundation



As evidenced by experience across the U.S., the intellectual property produced within a state is not necessarily commercialized within the state. Unless there is infrastructure, a mindset and the resources to convert ideas into new products and services on the ground, patents and ideas will be taken to the location with a more viable setting. Nevada has operated for far too long as a national source of intellectual property - almost as a large Federal laboratory - but, with little conversion of these ideas into new products and services commercialized within the State. Table 7 in Appendix C summarizes the top Federal grant and contract funding programs in Nevada from 2000 to the first quarter of 2010.

The current Nevada patent portfolio suggests that there are any number of sub-sectors for advancing commercialization strategies based on existing research applications and market demand. Working in partnership with industry and Federal scientists and engineers - both within Nevada and throughout the U.S. - a consortium for new discoveries could be a springboard for future innovation, commercialization and product development efforts.

Medical Instruments (devices) and for Biochemistry (with impacts on energy, biologics)

Figure 3: Nevada's Biomedical Cluster

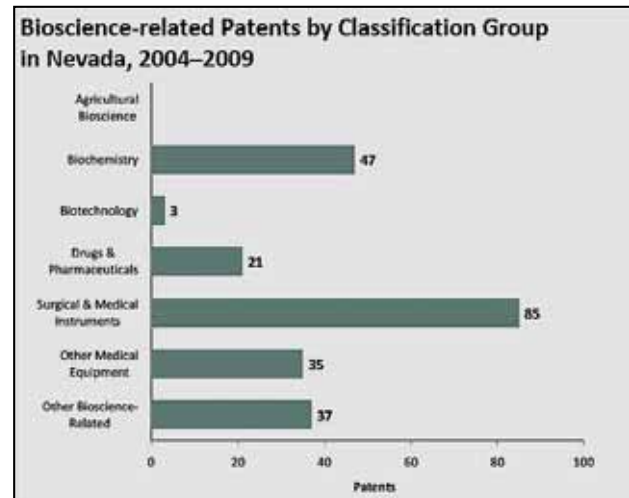


Table 3: Commercialization Potential of Nevada Patents

Patent Sub-Sector	Commercialization Potential
Basic Electric Elements	Energy, Applications
Electric Communication Technique	Voice, Security, Information Services
Physics for Computing, Calculating, Counting	High Computational Analysis, Process Intelligence
Biochemistry: Microbiology	Drug Testing, Renewable Energy
Generation, Conversion of Power, Electricity and Other	Energy Grid, Transfer of Renewable to Power
Furniture, Appliances	Devices, Alternative Energy Appliances
Checking Devices	High Computational Analysis
Medical or Veterinary Sciences	Clinical Testing, Patient Products
Sports, Games, Amusements	Engineered Products for Entertainment, Digital Devices

In its profile of Nevada's biomedical cluster, the Biotechnology Industry Organization and Battelle identified the current patent portfolio within the life sciences (Figure 3). Most telling for distinguishing the future of the Nevada commercialization scenario are the number of patents awarded for Surgical and

“Commercialization”

“What is commercialization?” Providing an answer to this question is vital to understanding the ‘SILVER’ Spark’s value proposition as a guide for public and private sector interests. Using the broadest terms of commercialization, we suggest it to mean:

- Improving the profitability of existing firms, enterprises, and branches of operations based in Nevada of entities currently serving national and global markets by infusing new technologies, ideas, and solutions for each successive generation of products and services.
- Forming the necessary partnerships among chief science, market development, human resource, operations, brand, and other managers within Nevada corporations and those firms with ties to Nevada so as to identify the translational and applied research for accelerating new products and services to market.
- Transferring ideas discovered in academic and Federal laboratories as well as the dormitories of Nevada’s higher education institutions so as to enhance an existing



product or create a new enterprise, startup, and growth firm.

- Linking Federal facilities, operations, and land to the testing and evaluation of new discoveries in partnership with industry consortia, global corporate market-makers, and investors in search of a solution to advance an existing venture-backed firm.
- Exploiting the yet unrealized opportunity through serendipity by fostering innovation and commercialization ecosystem development throughout Nevada on which to respond to the needs of inventors, scientists, and the 'in-the-garage' discoverer.
- Sparking youth and students in classrooms and academic halls to stay in Nevada because the platforms exist for converting their small-scale ideas into large-scale products, services and improvements to the business or society.
- Building national and global market-share in Nevada as a location for niche products and services that no other location can deliver.

What commercialization is not.

- Commercialization is not measured only by the number of patents and licenses retained by the State nor the universities as

result of the transfer of a technology to the marketplace.

- It is not just for formation of small business innovation research (SBIRs) grants and contracts with Federal facilities, or cooperative research and development agreements (CRADAs) with regional laboratories - although these mechanisms and vehicles lead to a more robust innovation ecosystem.
- It is not the constant movement of ideas and products to other non-Nevadan locations for their ultimate manufacturing and distribution, although retaining every opportunity in Nevada will not happen.
- It is not about new facilities, laboratories, nor academic halls filled with the best minds and technologists, although the outcomes from commercial enterprises reinvesting in academic campuses, chairs and professorships signals a recommitment to excellence.

Therefore, commercialization in its broadest term is the placing of a strategic bet on the knowledge economy and the vital elements of the innovation ecosystem throughout Nevada by internal and external investors - both in the public and private-sectors – to accelerate economic diversification.



Section V: Competitive Assessment

A situational analysis of Nevada’s relative competitiveness has been developed from reviewing the findings and recommendations from twenty-five previous reports on Nevada’s economy

and diversification agenda (listed individually in Appendix F). Table 4, below, summarizes the findings.

Table 4: Nevada’s Strengths and Weaknesses

Where Nevada Leads	Hospitality and Gaming Infrastructure – with important intellectual property spinoff capacity to other sectors	Corporate Conventions, Gatherings, Events including activities attracting C-level decision-makers and investors	Mining and Extraction of Critical Minerals	Access to Major Industry and Technology Consumer Markets of the Intermountain West region	Creative Media, Entertainment Design, ‘Engineering of Staged Events’	Quality of Life factors most attractive to entrepreneurs, risk-takers, and innovators.
Where Nevada Competes	Large-Scale Public and Private Sector Project and Facilities Management	Underlying Testing, Evaluation, and Process Manufacturing Application Know-How	Access to Extreme Environmental Scenarios (Desert, Mountain, Heat, Cold) for Industry-Government Pilot Projects	A highly-accessible global airport and logistics center in the South; a tri-state highway connector in the North	Pricing of land, facilities, operations, and market access (reduced barrier to entry for growth firms)	Population and demographics for clinical trials and biomedical partnerships
Where Nevada Lags	Non-continuous flow of students, faculty, and inventors into the economy - few internships, externs, technology apprenticeships for example	Lack of large anchor industry or corporate R&D centers, contract research and testing sites, and unique ‘global’ academic-industry teams	Low graduation rates, testing scores, and other educational indicators limiting a future ‘Brains Matter in Nevada’ mindset	Disorganized risk-capital, other common innovation-based economic development resources on which to leverage federal, corporate and venture dollars	Minimal networks across geographic, industry, technological, and scientific interests to expand legacy sectors and skills	Shallow business case for entrepreneurial investment relative to deal-flow for investors

Despite the impressive growth of Nevada, red flags have been present for several years - warnings on the horizon about negative trends for the fundamentals in Nevada’s educational, business, financial, fiscal, governmental and organizational practices and policies. At no other time in recent history has Nevada been in a position to make seminal choices about its economic and business climate - choices that will more than likely place the State and its people on one of two pathways. The

challenge is to identify precisely where Nevada must improve as well as sustain competitive scenarios in light of several deficiencies.

The ‘SILVER’ Spark is focused on a scenario based on investing in innovation and commercialization, and the beneficial effects such investment will have on job formation, recruitment of industry, and the attraction and retention of brainpower as a means to repower Nevada.



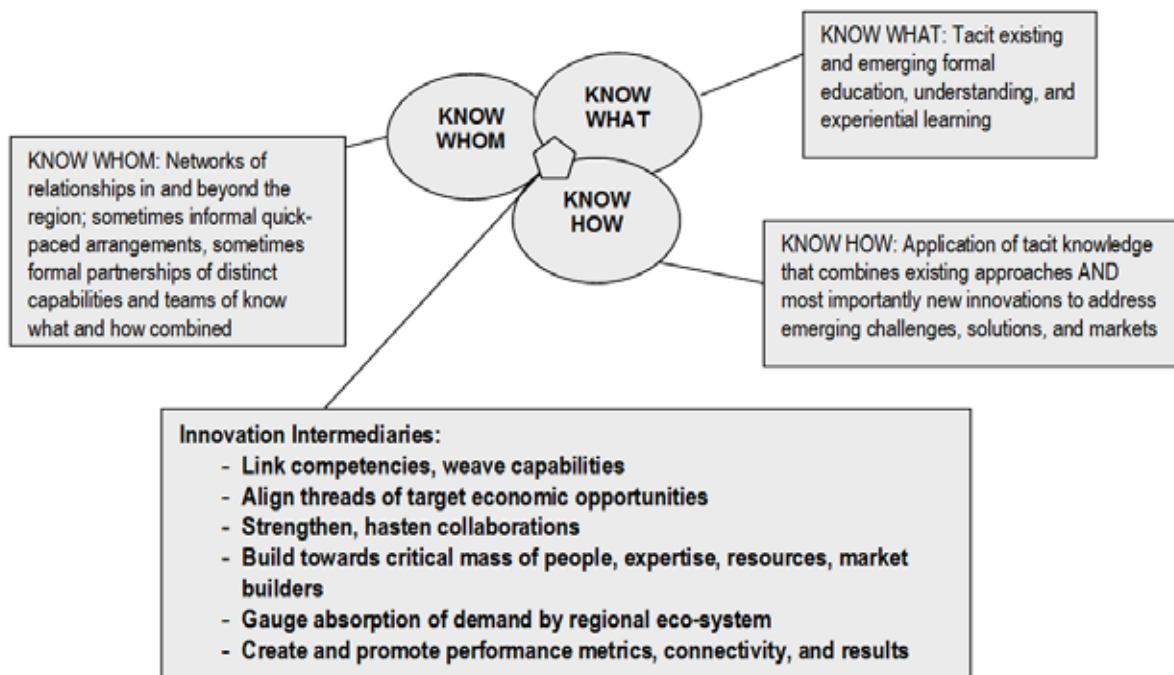
Section VI: Clusters of Knowledge

Given significant convergence, we have assessed cluster development at a level that focuses on competencies, occupations and skills rather than specific industries. For instance, in benchmarking Nevada’s mining and extraction cluster, we examined the Northwest U.S. food processors (including Idaho, Northern California,

Oregon and Washington State), the Upstate New York Optics Cluster, and the Australian Extraction Clusters. In these examples, we found skills once only identified in one cluster were now ensuring competitiveness in other sectors (for example, Rochester’s skills in optics and imaging are now being used in food inspection and for food security).

Figure 4: Underpinnings of Regional Competitive Knowledge Models

Underpinnings of Regional Competitive Knowledge Models



Source: *New Economy Strategies, LLC*



In some locations, expertise in chemical manufacturing and production are now directly benefiting pharmaceutical and biologic developments. Historically the importance of rum and whiskey fermentation and production directly resulted in future clusters in Puerto Rico and Ireland for their global pharmaceutical economies. More recently, Southern California and Denver's strengths in aerospace (and advanced materials) have directly attributed to design and manufacturing in solar and wind alternative energy clusters. Greater Kansas City and to some degree the State of Kansas as a whole hosts nearly 40% of the global market-share in animal research, testing and product development that led to the attraction of a recent \$500 million federal laboratory and the recruitment of several global corporate expansions.

Therefore, Nevada must consider broadening its focus on clusters to include linking critical elements of 'know-what, know-how, and know-whom' that emerge from an integrated, multi-disciplinary and networked economy. The successful adoption of industry clusters by numerous state economic development organizations however requires a more in-depth assessment and upgrading of economic strategic planning as discussed in more detail in Section B of the Appendix.

We have identified five unique 'clusters of knowledge' in Nevada that leverage existing skills and investments, but also require a purposeful decision by the economic and workforce 'communities of interest' to determine if and how the State will compete in the years ahead. We define a 'cluster of knowledge' as the accumulation of expertise, of know-what and know-how across disciplines, skills, and talent so as to form teams around technological and entrepreneurial endeavors. These 'clusters of knowledge' are not mere aggregates of jobs and employment; rather we examine a unique capability based on the occupations, training, and talent pool current available to a state or region.

What has driven the so-called knowledge economy is the alignment and blurring of the lines across

disciplines, technologies, and even the industries that have been the staples of the U.S. and global business landscape during the 20th century. As discussed further in Appendix B, elements of scientific and technological 'threads' now blend to foster new products, services, and occupations on a daily basis.

These fast-moving trends are causing constant disruptions in business models. As an example, biotechnology and energy, nanotechnology and manufacturing are cross-fertilizing in research laboratories and on product development whiteboards around the world. In promoting a Nevada innovation ecosystem 'economic development strategy' – we must assess the State's assets based on their potential for collaboration rather than through the traditional stovepipes.

Simply, Nevada has an opportunity to advance its competitiveness by adopting a multi-faceted innovation-driven economic recovery by focusing on those opportunities that leverage several disciplines and market-needs.

Figure 5: Technology Cluster Interdisciplinary Collaboration





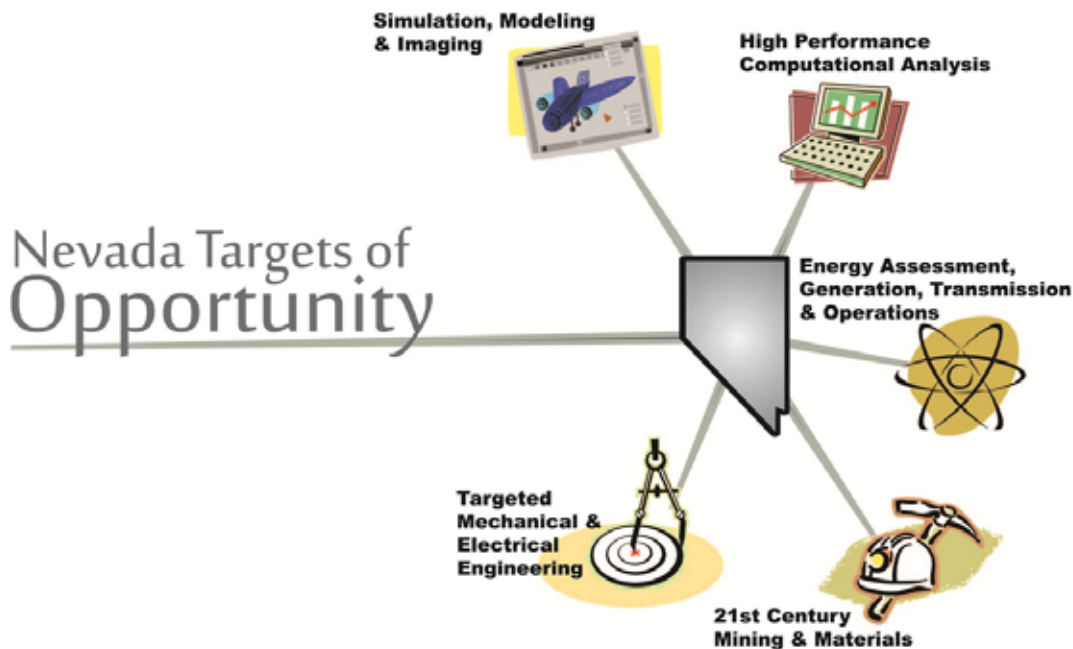
Section VII: Targets of Opportunity

Several different data sources describing current industrial activity, employment and occupational trends were used in developing the recommendations below. Appendix B includes a number of charts depicting occupation and workforce trends in Nevada. In addition, we reviewed investment activity by academic, business and government interests in Nevada against the backdrop of global trends and forecasts. Finally, we examined the output from research, development, applied technologies and industry operations, identifying current and emerging intellectual

property and commercialization potential for Nevada. By themselves, any one of these targets has significant promise to create jobs, raise incomes, and ultimately reestablish the Nevada innovation brand; all five combined increase the likelihood of a strong “portfolio” on which to immediately launch commercialization strategies, investments, and recruitment to the State.

The analysis of “Nevada’s Research and IP Portfolio” generated five distinct targets of opportunity.

Figure 6: Targets of Opportunity in Nevada



Appendix E lists approximately one hundred (100) Federal, Academic and Non-Profit Laboratories, Centers, Institutes, and Consortium located throughout Nevada that provide extensive basic and applied research in significant market-making technologies, tools, software and business processes. Nevada’s research portfolio includes potential commercialization opportunities from 3-D mapping to environmental risk-mitigation modeling, from air-borne emission filters to micro-scale manufacturing using powerful high performance computing, with applications as far-flung as facial recognition to prevent theft and fraud or converting the sun’s rays into hydrogen fuel for transportation and electricity supplies. This portfolio supports the recommended targets of opportunity in new products and services found herein.



Cluster of Knowledge: Simulation, Modeling & Imaging



Description:

Defense and gaming industries have conducted on-going research, filed for patent rights and assignment and required continuous product development for both assisting soldiers on the battlefield and in driving billions of dollars in gaming receipts. These demands are expected to rise with additional uses of drones and other unmanned aircraft as well as expanded gaming response to global consumers.

New Opportunities:

By applying simulation, modeling and imaging to environmental and energy related assessments, reducing theft and fraud through facial recognition, and diagnosing disease and human structure, Nevada is positioned to compete globally.

Asset-base Selection as a Knowledge Cluster:

- **Federally-Funded Research:**
National Science Foundation (\$114 million in Math, Physical Science, Cyber Infrastructure, Computer and Info Science Engineering); Department of Energy (\$77 million in Defense Non-Proliferation, Nuclear Energy Research, Advanced Nuclear Medicine); National Institutes of Health (\$118 million in Disease-Related Research).
- **Patents and Other Intellectual Property:**
Over 70 patents assigned in fields aligned to Simulation, Modeling, and Imaging (IGT, AT&T); Patent Sub-Categories including Electric Communication Techniques, Checking Devices, Sports-Games-Amusement.
- **Skills and Competencies:**
Information systems architects, geological mappers, mathematicians, health records information managers, artificial intelligence code developer.
- **Example Facilities, Equipment, Infrastructure:**
US Warfare Center, Marine Corp Warfighting

Laboratory, Desert Research Institute, UNR Earthquake Engineering Simulation Lab,/Evolutionary Computing Systems Lab/Cyber Conflict Research Consortium Agent Modeling Lab, UNLV Identify Theft & Financial Fraud Research and Operation Center/International Gaming Institute.

Targets of Opportunity:

Unique Commercialization Products and Services

- Software and Business Intelligence Analytics for Environment Assessments - Services
- Identity Facial Recognition Software, Embedded Devices for Homeland Security – Products
- Crime Laboratory and On-Site Investigation Forensic Tools - Products
- Neuroscience-Brain Function Imaging Mapping Software and Data Management - Products
- Nuclear Medicine/PET/MRI, Radiation Oncology Handheld, Portable Equipment - Products
- Non-Invasive Diagnostic Field-Kits for Military, Emergency Personnel, HazMat Teams – Products
- Clinical Trial Drug and Device Testing, Invitro Patient Participation - Products
- Risk Mitigation 3-D Modeling “Theaters’ for Corporate Training– Products, Services
- Energy Sourcing for Land-Use and Conservation Management – Services

Potential Market Size and Scale:

Global medical device sector is \$40 Billion per annum, growing 8%+ in certain specialties; Simulation and Modeling software aligned with business analytics is currently a \$500 million sector in the U.S. today, expected to reach \$3 billion by 2017-2018.

Example Recruitment and Attraction Supply Chain:

AT&T, Canon Medical, GE, IBM, Lockheed, Samsung and Siemens.



Cluster of Knowledge: High Performance Computational Analysis



Description:

With the commitment of SWITCH, Nevada has attracted the next generation of high through-put computing and information services bandwidth that has historically existed to the sole benefit of the U.S. Departments of Defense and Energy. Based on Nevada's role in critical test-evaluation programs for weapons systems, reduced nuclear arsenals, and on-going monitoring of operations requiring massive computational analytics, the State has significant depth in the skills and competencies for emerging applications.

New Opportunities:

As noted in the previous cluster (simulation, modeling, and imaging), new demands for evaluating product design, advanced and complex manufacturing, toxic waste storage and/or reuse, and other scenarios in live demonstrations and field tests can be scaled in Nevada immediately and successfully. The formation of contract testing and evaluation operations in partnership with industry and government customers can take advantage of Nevada's unique capabilities.

Asset-base Selection as a Knowledge Cluster:

- **Federally-Funded Research:**
National Institute for Standards and Technology (\$26 million for Manufacturing Extension Programs, Advanced Technology Programs); National Science Foundation (\$112 million for Math and Physical Sciences, Computer and Information Sciences), Department of Defense-Army and Air Force (\$42 million in Research Programs DARPA, Technology Development).
- **Patents and Other Intellectual Property:**
Patent Sub-categories include Physics for Computing, Calculating, Counting; Furniture and Appliances; Electric Communication Techniques.
- **Skills and Competencies:**
mathematicians, industrial engineers, data analysts.

- **Example Facilities, Equipment, Infrastructure:**
SWITCH, Air Force Bases (Nellis), Desert Research Institute, UNLV National Supercomputing Center for Energy & The Environment/Nevada Manufacturing Research Center, UNR High Performance Computation and Visualization Lab/ Computer Vision Laboratory/Goodman Brain Computation Lab.

Targets of Opportunity:

Unique Commercialization Products and Services

- Product Testing in Harsh and Extreme Conditions - Services
- Testing, Calibrating, and Evaluating Machinery and Equipment - Products
- Collection Methodologies, Tools, Measurement in Field - Products
- Manufacturing Process Improvements – Services
- Advanced CAD-CAM Cloud Computing Tools – Products

Potential Market Size and Scale:

Testing and Evaluation for Manufacturer is a global \$20+ billion sector with several sub-markets (automotive, electronics, environmental products, etc.); Cloud computing reliance is increasing demand on newer technologies and applications, including mobile and just-in-time evaluation results from field tests.

Example Recruitment and Attraction Supply Chain:

Amazon, IBM and Oracle for high-performance computing; ABB, BAE Systems, Dickson, Fisher Technology, SGS Industrial and Wheelabrator for advanced manufacturing.



Cluster of Knowledge: Targeted Mechanical and Electrical Engineering



Description:

Industry on the whole, the defense community, and the overall mining and energy sectors have amassed significant skills and competencies in mechanical and electrical engineering for decades throughout Nevada. And yet, overlooked are the engineers that design and launch the most widely regarded entertainment venues in the world for the staging of multi-million dollar performances. The technologies and knowledge behind compression valves and fluid power units to lift tons of heavy machinery in the geothermal fields of Northern Nevada are similar to the staging that lifts actors and acrobats in Cirque du Soleil's KA.

New Opportunities:

Engineering is the underpinning to the innovation and commercialization strategies of any new product in the marketplace today. The majority of these skills and competencies are found not only on the State's academic campuses, but, in the military, energy-related and entertainment facilities where critical materials, filters, and event staging require constant upgrades, maintenance, and innovative techniques for the safety of personnel and the reliable operation of sophisticated facilities and equipment.

Asset-base Selection as a Cluster:

- Federally-Funded Research:**
 Department of Defense (\$7 million in Engineering-related Research); Department of Commerce NIST Programs (\$26 million); National Science Foundation (\$29 million Engineering Programs); National Institutes of Health (\$53.6 million in Blood-Lung-Immunology-Biomedical Technology Research) Environmental Protection Agency (\$32 million Clean Air-Water Programs).
- Patents and Other Intellectual Property:**
 Second largest patent portfolio for Nevada is in Mechanical Engineering; Sub-Patent categories include Basic Electric Elements, Biochemistry; Microbiology; and Furniture-Appliances. Ormat Technologies, Sierra Engineering, Bentley Nevada, Life Shield Engineered Services, Encore

Medical Asset Corp. are leading patent assignees.

- Skills and Competencies:**
 mechanical and electrical and electronic engineers, materials handling and packaging, industrial design and process manufacturers, lighting and stage crafts, environmental scientists.
- Example Facilities, Equipment, Infrastructure:**
 UNLV Program in Entertainment Engineering & Design/High Pressure Science and Engineering Center/Biomechanics Lab, Cirque Du Soleil Engineering Division.

Targets of Opportunity: Unique Commercialization Products and Services

- Micro- and nanoscale materials for photovoltaic/solar panels - Products
- Air and water filtration systems and monitoring equipment – Products
- Micro-scale medical devices for neurological and aging patients – Products
- Large-scale staging equipment, digital media production – Products
- Environmental-focused mechanical engineering and design – Services

Potential Market Size and Scale:

Micro- and Nanoscale consumer and health related products will reach \$5 billion globally by 2020 based on approvals; Filtration and monitoring systems are currently \$2.8 billion in US sales; Staging and event engineering related products are approximately \$1.5 – 4 billion sector based on classification.

Example Recruitment and Attraction Supply Chain:

3M, Air Products, Ball Corporation, Bayer Material Sciences, Coors, Dow and Dupont regarding micro- and nanomaterials, filtration; Abbott, Allergan, Johnson & Johnson, Medtronic regarding devices; Dolby, IGT, Parker-Hannifan, Phillips, Rockwell Automation, Siemens and Tyco Electronics for entertainment engineering and event staging.



Cluster of Knowledge: Energy Assessment, Generation, Transmission, and Operations



Description:

The capacity for Nevada to be a net-exporter of energy has already been proven by nationally distinguished federal laboratories in Berkeley, Boulder and Pittsburgh for example, and through the U.S.

Department of Energy's own analyses placing the State in the forefront of geothermal, solar, nuclear, and other alternative sources. The Intermountain West region looks to Nevada as a significant partner in developing the generation and transmission capacity to meet current and future energy demand.

New Opportunities:

From its important role in enabling the harnessing of nuclear energy for military use, Nevada has a rich and robust capacity to examine and assess energy-related generation and operations through both basic and applied research, as well as to define the technological solutions required to manage alternative sources of energy beyond current coal-fired and other high-emission facilities producing the Nation's electricity. These technologies will include a wide range of products and services to convert the state's vast solar and geothermal and, to a lesser degree, wind-sourced power into traditional and evolving 'smart grids' as well as solutions for monitoring homes and offices for energy efficiency.

Asset-base Selection as a Cluster:

- **Federally-Funded Research:** Department of Energy (\$182 million in Renewable Energy, Science Assistance, Environmental Management, Nuclear Energy, Energy Efficiency, Waste Disposal, and Fossil Energy Research Programs); National Science Foundation (\$21 million, Geological Science Research); Department of Agriculture (\$500K, Bioenergy Research); Department of Commerce (\$19 million, NOAA Research).
- **Patents and Other Intellectual Property:** the largest portion of the Nevada patent portfolio is assigned to energy-related fields, with Sub-Categories including Generation-Conversion of Power-Electricity-Other, Electric

Communication Technique, Biochemistry, Microbiology.

- **Skills and Competencies:** Microbiologists, civic engineers, electrical engineers, hydrologists, nuclear scientist, architects, laboratory operators and managers.
- **Example Facilities, Equipment, Infrastructure:** UNLV Center for Energy Materials Interaction Technology Initiative/Natural Energies Advanced Technologies Lab; UNR Terrawatt Facility/Bioresource Renewable Energy Lab/Engineering Access Grid Node/Electrical Power & Renewable Energy Systems Research Lab; Desert Research Institute; NV Energy Initiative in Smart Grid Development.

Targets of Opportunity: Unique Commercialization Products and Services

- Short- and long-term battery and other storage capacity – Products
- Solar-to-Hydrogen-to-Electricity technologies – Products
- Large-scale Giga-watt Facility Design and Management – Services
- Energy Audits, Carbon Emission Evaluations on Mobile Devices – Products
- Urban and Transit Renewable Energy Design Software and Tools - Services

Potential Market Size and Scale:

Construction Design/A&E/Operations is expected to reach \$28-32 billion by 2020; Conversion technologies in solar, geothermal, and related alternative energy sources could reach towards \$3 billion in 2012. Carbon sequestration, power grid-upgrades, and other technologies have an approximate 10-13% growth per annum starting in 2015.

Example Recruitment and Attraction Supply Chain: ABB, Acciona Energy, Autodesk (Energy) Software, Black & Veatch, BrightSource, Burns & McDonnell, Chevron, Flour Power, Foster Wheeler Ltd., General electric, Honda, Honeywell Energy, Mannvit USA, Parsons Brinckerhoff, Siemens and Solei Solar



Cluster of Knowledge: 21st Century Mining and Minerals



Description:

The oldest industrial sector of Nevada cannot be overlooked for its continued importance to the economy and its global reach of expertise and knowledge – mining and extraction of minerals. Though often focused on gold, silver and copper, the Nevada mining sector has identified a number of base minerals for additional benefit to manufacturing, health-care, and materials. These include diatomite, gypsum, lithium, magnesia and zinc. Millions of acres of open land provide the 'laboratory' for experiment and testing of minerals for new application.

New Opportunities:

Base mineral research has been somewhat overshadowed by the focus on renewable and alternative energy in Nevada, though the Colorado School of Mines and similar institutions have a positive outlook on the next generation of mineral uses, and therefore a renewed perspective on Nevada's contributions. Materials using advanced minerals for electronics, consumer goods, and packaging have begun to accelerate as have the realities of minerals in diet and nutrition strategies for both human and animal consumption.

Asset-base Selection as a Cluster:

- **Federally-Funded Research:**
Mining research dollars from federal funding is very limited (less than \$1.5 million), yet with the Federal Funding of nearly \$63 million from the National Institutes of Health (Digestive, Aging, Allergy, and Alzheimer's Research) and the Department of Agriculture (\$22 million in Animal-related Research), the opportunity to leverage resources is abundant.
- **Patents and Other Intellectual Property:**
Current patenting in or around mining and extraction have been flat for the past decade, though assignees in Nevada have retained ownership of historically strong patent rights.
- **Skills and Competencies:**
Nevada Mining Association and related industry

activities in support of regional mining; Desert Research Institute; University of Nevada - Reno, and the presence of the world's largest extraction corporations and expertise.

- **Example Facilities, Equipment, Infrastructure:**
UNR W.M. Keck Earth Sciences and Mining Research Center/Nevada Seismological Lab/Active Materials & Processing Lab.

Targets of Opportunity: Unique Commercialization Products and Services

- Nutraceuticals, Vitamins and Nutrition Supplements for Humans and Animals – Products
- Advanced Minerals-Material Production for Electronics, Aerospace, Energy Efficiency – Products
- Minerals as Catalysts for Alternative Energy or By-Product Development - Products

Potential Market Size and Scale:
\$60 billion per annum in mining and minerals on a global scale; \$5 billion in nutrition supplements, health and well-being programs; \$9 billion in new material-mineral applications for electronics sectors.

Example Recruitment and Attraction Supply Chain:

Anglo American, Barrick, Gold Canyon, Kiewit, Newmont, and Sandvik for expansion into new mineral production; DowAgric, Hills ScienceDiet, Nature's Bounty, Purina, Schiff Nutrition and Unilever for related consumer products.



We believe these five unique competitive advantages - targets of opportunity - organized as centers of innovation and commercialization excellence - could spark immediate and longer-term results for job creation, investment, and new revenues for both public and private sector interests.

Rather than aiming broadly at industry clusters, these clusters of knowledge are largely in a 'ready-to-go formation' stage missing only the capacity to be organized, funded and supported by a new Nevada intermediary that bridges the innovation, commercialization and entrepreneurial processes as further discussed in Section IX.

We believe that each identified sub-element around these five main themes represent existing and/or emerging products, services and profitable market-making scenarios that distinguish Nevada from other competitors. We also believe that the asset-base is available as further discussed in Appendix A and Appendix E, but requires immediate and consistent investment by State and Federal partners. And we further believe that the private sector, academia, industry consortia, and sector-related organizations and associations are ripe for discussions about enabling and actively promoting these opportunities.



Section VIII: Best Practices

We have examined over twenty unique responses to the similar conditions and challenges now faced by Nevada. Over the past ten years, more and more states and regions have adopted innovation-based and commercialization-driven strategies leveraging public and private-sector research and development along with related entrepreneurial and investment initiatives. Two of these have already been examined by Nevadans in detail – including the Georgia Research Alliance and USTAR initiatives – along with other comparable efforts to spark growth from ideas found in academic, business and government laboratories.

These select best practices and benchmarks have common themes, and for purposes of identifying those elements that best fit Nevada, we have identified the six highest common denominators below for review by policy-makers, including:

- Targeted to clustered “knowledge” growth and overall economic job creation by staying focused on those opportunities that distinguish their economies from other competitors – thereby connecting networks of unique expertise, long-standing human capital know-how.
 - Leveraged with higher education, research enterprises (including Federal laboratories, non-profits, and corporate facilities) thus sparking new mindset and appreciation for commercialization results and reinvestment of new revenues.
 - Focused on early stage, seed-capital aspirations by identifying a portfolio of companies and stages of growth to ensure continuous opportunities; further, creating ‘evergreen’ reinvestment tactics to ensure equity, licensing, royalties flow back into the larger program areas for next rounds.
 - Linked to value-chains in technology sectors, science opportunities for immediate application to markets and society benefits.
 - Ties new research teams to industrial partnerships and consortium formation around key technology targets of opportunity.
 - Forms long-term, stable program development with specific metrics and stated outcomes -
- programs that survive from one public sector officeholder to the next rather than end upon the next election cycle.
- What is vital to creating a unique model for Nevada’s innovation and commercialization-based opportunities is to learn from others that have had successful transitions into sustainable economic growth, realizing which elements are most applicable to Nevada’s current scenario and even developing a new model that could become a national best practice in its own right.
- Seeking to find a precise comparison to other states and regions and then replicating their model will result in unfortunate outcomes and lowered expectations. Best practice and benchmarking, based on previous experiences and engagements, has its greatest value in leveraging lessons learned - success and failure - to ensure that the ensuing Nevada model for innovation and commercialization produces immediate and sustainable results for job creation, wealth generation, and increased standards of living for all citizens.
- As noted in previous sections, the Nevada scenario and landscape is unlike any other state no matter the commonalities of context, population, proximity or size. For example:
- Nevada is similar in condition to Hawaii (with its extensive land ownership by Federal, state, and historical trusts limiting certain opportunities for leveraging resources for economic productivity).
 - Nevada is similar to the eastern region of Tennessee with a combination of the Oak Ridge National Laboratory and the University of Knoxville (recently forging a partnership to co-manage the laboratories’ research, discoveries and development for the benefit of students and commercial enterprises).
 - Nevada is similar to Rhode Island (overshadowed by Massachusetts and the Boston research corridor’s significant success that has drawn away talent and investment from Providence’s universities and corporations).



Importantly, what is common in all of these and other benchmarked states and regions, is that academic, business, civic, entrepreneurial, investment and philanthropic leadership coalesced to find solutions not entirely based on public sector resources, but on new partnerships co-funded and co-led by mutual self-interests for growth.

Simply, Nevada requires the execution of a handful of key actions, funded at levels that will sustain work over three to four years for the ‘wheel to turn’ enough times, leading to early victories and measurable long-term results. It is in the prioritization of those actions and allocated resources – with a laser-like focus - that other states have successfully progressed from where Nevada is today and made good on the promise of economic transformation.

The following examples have been selected as representations of unique circumstances applicable to the current discussions and debate across the State around next steps for Nevada’s economic recovery and rebuilding.

Orlando – ‘Team Orlando’

‘Team Orlando’ is the culmination of a forty-year history in information technologies that began with support services to the state-wide Florida defense-related presence of U.S. Air Force bases and operations. Through the work of the Metro Orlando Chamber of Commerce, the University of Central Florida, and retired senior military officers, the past decade has been an evolution of the regional economy beyond the “House that Mickey Built” as Walt Disney World was referred to locally.

Figure 7: ‘Why Orlando?’

Metro Orlando has long been recognized as the **NATION'S EPICENTER** for modeling, simulation and training (MS&T) technology.

As the largest MS&T cluster in the country, this sector in Metro Orlando includes:

- 150+ companies
- 32,000 workers
- Gross Regional Product of \$3 billion

Simulation applications developed in Orlando have evolved over the past 40 years. Growing from our roots in military training, today the region's MS&T industry contributes to such diverse fields as:

- Aviation and Aerospace
- Education
- Emergency Services
- Entertainment
- Homeland Security
- Information Technologies
- Medical Technologies
- Microelectronics
- Optics and Photonics
- Transportation

NATIONAL CENTER OF EXCELLENCE IN SIMULATION AND TRAINING

WHY ORLANDO?

- More than 150 MS&T companies**
Provides partnering and leveraging opportunities for new business ventures.
- Gross Regional Product of \$3 billion**
Deep cluster includes companies of all sizes, supported by professional services.
- Training System Procurement Commands for the U.S. Military**
\$2 billion in annual contracts awarded to prime and sub contractors through Army, Navy, Air Force, Marine Corps and Coast Guard Training System Commands, all based at the renowned Central Florida Research Park.
- University of Central Florida, \$3,600 strong**
One of only three universities to offer Ph.D. for MS&T, 2nd largest university in nation, prominence in engineering and computer science.
- Embry Riddle Aeronautical University**
Top aviation and aerospace school offers renowned flight and air traffic control simulation programs.
- Research Funding**
Matching fund research dollars and R&D collaboration available through unique university partnership programs.
- Blend of Military and Entertainment Technology**
Local access to skilled animators, storytellers and game developers provides competitive edge in designing effective products.
- Headquarters for the National Center for Simulation**
Leading industry trade association provides interface between military, corporate, government and academic partners.
- Global Corporate Presence**
Lockheed Martin, SAIC, Northrop Grumman, General Dynamics, Saab, 3D Communications, Rockwell Collins, CAE, Silicon Graphics, Intra Systems, JHI, Wyle, DSI.
All major industry players with a major presence in Metro Orlando!

"Orlando and Central Florida are the epicenter for modeling and simulation. When you combine the power of the Research Park, close ties between a world class university, private industry and the military, you produce a synergy found nowhere else in the world. Companies who want to be serious players in the modeling and simulation industry need to consider joining their efforts on Orlando and Central Florida."

— Thomas J. Baggett
Lt. General, USAF (Ret)
President/Executive Director
National Center for Simulation



The Center for Research and Education of Optics and Photonics (CREOL) was founded as a partnership with industry to support the emerging cluster program led by the University President and Vice President of Research. Collectively, the focus was to increase total Federal and industry funding through CREOL to jump-start the commercialization objectives for attracting and recruiting faculty, forming national-level corporate partnerships for technology development, and create an angel network for early-stage enterprise support.

By 2005, the identification of a ‘simulation and training’ center as the turning point for national recognition began to take shape. Today, Metro Orlando has transitioned from an entertainment and tourism ‘brand’ to the fastest growing simulation hub for biomedical, defense, and digital media production.

As evidence of its prowess, the Team Orlando initiative is fully integrated through a web-presence that connects scientists, technologists, investors, and market interests, as well as links every asset in the

region electronically for both local interests and global inquiries.

Over the years, a hallmark of the strategy is the annual gathering of defense, homeland security, and intelligence personnel with commercial and corporate representatives in Orlando’s expanded convention center for the largest expo on virtual reality products, technology applications, roundtables and forums on cutting edge discoveries, and ‘deal-making.’ New venture firms and early-stage investment groups have been sparked in Greater Orlando to respond to national investment firms ‘picking-off’ startups for relocation to other states and nations.

Increasingly, the U.S Department of Defense has expanded operations and programs to Orlando to exploit the local knowledge-base and expertise that has been attracted to the quality of life and resources offered to academic researchers and scientists as well a graduates and young entrepreneurs

Figure 8: ‘Team Orlando’

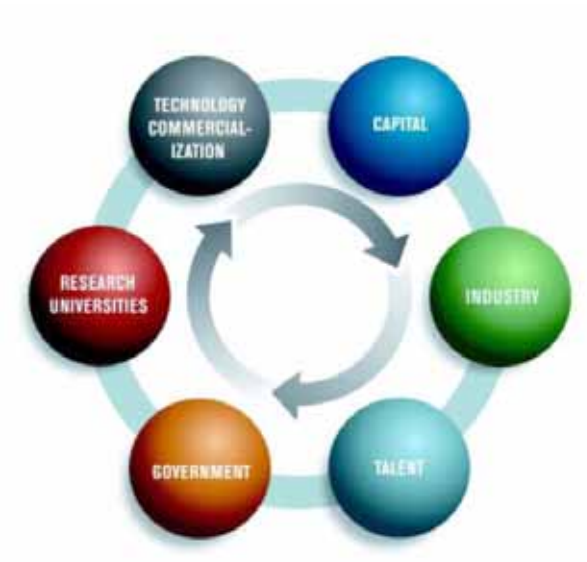




Utah – Science, Technology and Research (USTAR) Initiative

In recent weeks, the ‘Utah Story’ has been discussed throughout Nevada by numerous academic, business, civic, entrepreneurial and government leaders. Figures 9 and 10 below summarize Utah’s Economic Strategic Plan, initially driven by former Governor Huntsman’s interest in changing perceptions about Utah’s innovation prospects and competitiveness.

Figure 9: USTAR Commercialization Building Blocks



“Clusters are geographic concentrations of interconnected companies, specialized suppliers, service providers and associated institutions in a particular field. Clusters encompass an array of linked industries and other entities important to competition.”

Michael E. Porter, “Clusters and the New Economics of Competition”, Harvard Business Review

The key is to bring industry, talent, government, universities, technology and capital together around industry sectors that possess the greatest opportunity for success. Their collective excellence allows all companies within the cluster to grow and thrive, resulting in increases in the standard of living within a region.

“Rich” with a unique DNA-data base on the Mormon population as a potential asset for personalized medicine, a previous track-record in software and computer technologies, access to global markets through existing corporate relationships and a civic leadership engaged to leverage its hosting of the Winter Olympics, Utah was poised to advance a new economic agenda for growth. However, standing in its way from progress was the lack of new academic research facilities, retirement of faculty or their flight to other locations and a missing sustainable program for commercialization and entrepreneurship.

Through the work of Dr. Jack Brittan, then chair of both the business school and an economic research unit at the University of Utah, a data-supported business case was prepared for the Governor, the president of the largest Utah commercial financial institution, a serial investor-entrepreneur, and a host of business, civic and economic development leaders seeking to compete against Arizona, California, Colorado, Oregon, Washington State, the Research Triangle Park in North Carolina and the Boston corridor.

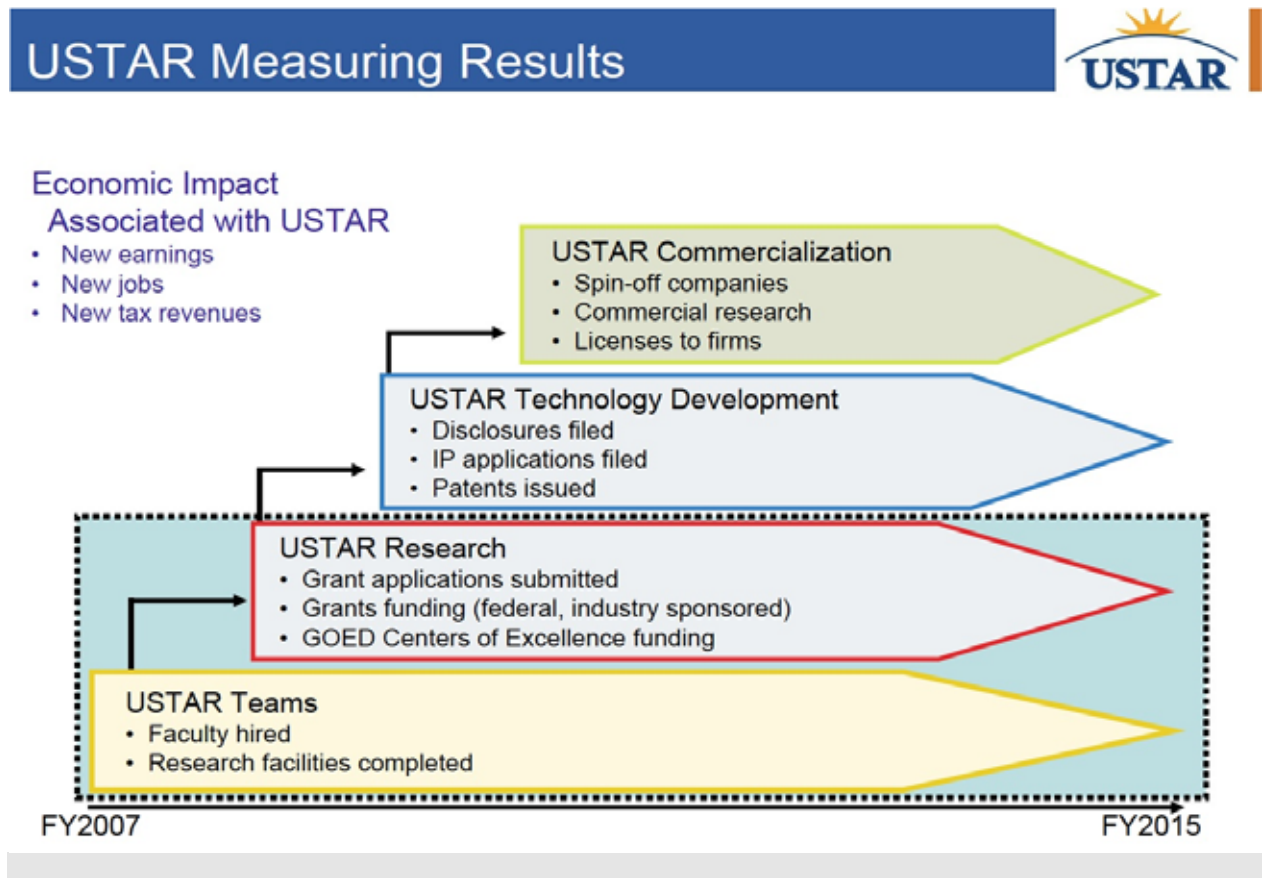
Two vital partners joined in ensuring the USTAR model had both political support and sustainable resources - the newly-formed Utah Technology Council and the EDUtah, an outsourced, contracted economic development team devoted solely to recruitment and attraction of companies as well as sophisticated marketing of the State’s assets to target sectors and industries.

Leveraging the nascent ‘centers of excellence’ program, USTAR coupled with the Governor’s Office of Economic Development (GOED) began to strength academic research partnerships for technology transfer and commercialization, connect scientists and investors with mentors and align workforce development information and programs to ensure future employers had the skills and talent readily available to meet growth demands.

As a consequence of the USTAR plan, the following timeline was generated to monitor resource allocation and outcomes for the Board and statewide interests:



Figure 10: USTAR Timeline and Targeted Results



While there are many statistical similarities between Nevada and Utah, including:

- A population of 2.7 million people in Nevada versus a population of 2.8 million people in Utah.
- An urban concentration of approximately 85% in Nevada versus an 80% in Utah.
- Three research universities (including DRI in Nevada) located in both states.
- Histories of both mining and tourism – although Nevada’s tourism industry is gaming focused.
- Deep connections to California, with Utah considering itself a distant suburb of the San Francisco Bay Area.

- A deeper base of academic research in Utah.
- An established and active venture capital community in Utah.
- A history of technological innovation, commercialization and entrepreneurship in Utah.
- Impressive concentrations in digital media, medical devices and software in Utah.

There are also significant differences as well, including:

- A considerably more homogenous population in Utah, with a statewide legacy of active civic involvement.

The USTAR initiative, like Team Orlando, Innovation Philadelphia, and the Texas Emerging Technologies Fund, has its greatest value to Nevada in leveraging lessons learned - both in success and failure. Nevada is uniquely Nevadan, and ultimately developing the best solution for the State goes beyond simply duplicating something developed specifically for another state or region.



Philadelphia - Innovation Philadelphia

The one program that has served as a milestone for a number of other states and regions is the technology investment strategy created by Innovation Philadelphia in partnership with the Commonwealth's economic development agency, the Ben Franklin Technology Partners program, and regional academic and industry investors.

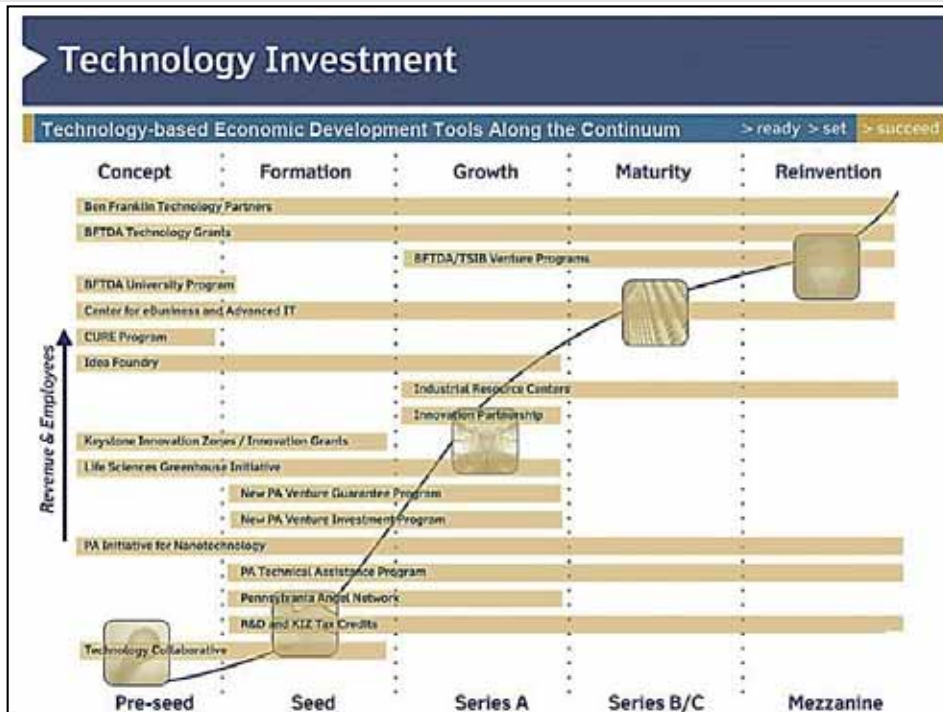
Based on his work as Chairman of the Kansas Technology Enterprise Corporation (another exemplar model), and through his examination of over 1,000 applications to the Ernst & Young Entrepreneur of the Year Awards process, Richard Bendis (Innovation Philadelphia's CEO) worked with an "executive-driven working group of angel and venture capital investors, serial entrepreneurs, CEOs of Fortune 500 companies, and university chancellors and presidents to design a framework for investing sparingly in those activities that would have the maximum return on investment and the 'biggest bang for the buck' in the way of changing perceptions about Philadelphia. Though blessed with over thirty universities and research institutions within a ninety minute drive from the central city, with more software engineers and programmers

than in Redmond, Washington (home to Microsoft), and access to the so-called "money-belt" in New York and Washington, D.C., Philadelphia was not commercializing its intellectual property at rates compared to similar regions and states.

Regionnovate conducted Innovation Philadelphia's mapping exercise that identified targets of opportunity to be plugged into the investment pipeline and created new programs only where gaps existed. Otherwise, those programs and initiatives already underway became vital partners in 'owning' the implementation through a business-plan approach to regional economic strategies.

Several smaller funds were created by the technology investment strategy of Innovation Philadelphia including two of note for Nevada: a leverage fund for attracting additional Federal R&D grants and contracts, and a regional economic development fund to recruit vendor-supplier chains around the targets of opportunity by attracting national and global firms and spin-offs to the region. Figure 11 below describes the comprehensive suite of Technology-based Economic Development (TBED) tools that underlie Philadelphia's approach.

Figure 11: Innovation Philadelphia TBED Tools

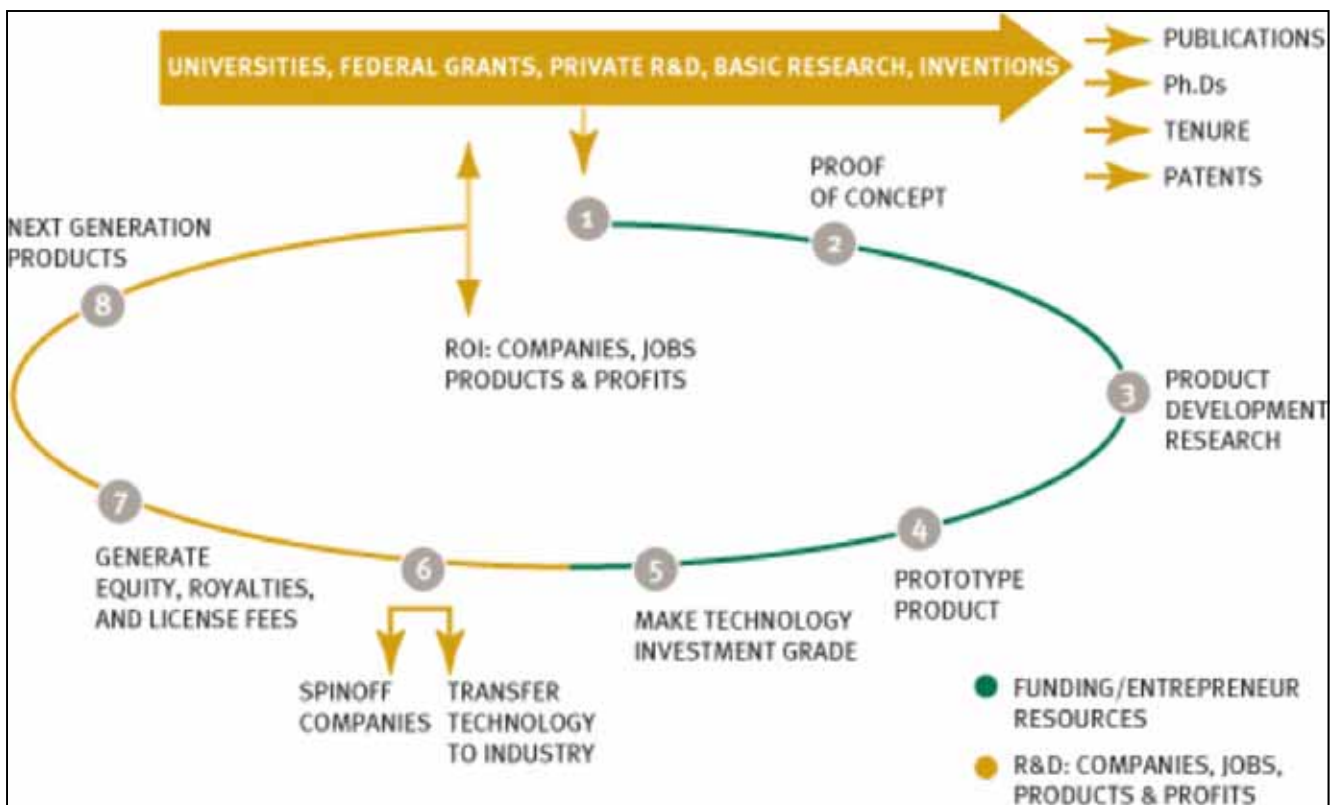




In turn, the highly-regarded Philadelphia Science Center, long a hallmark of academic-industry partners and in its infancy a unique incubator with corporate ownership by all the academic institutions in the region, had fallen in its response to market opportunities as well as become a real-estate strategy rather than a technological strategy. By forming Innovation Philadelphia, then President of the University of Pennsylvania (Judith Rodin) and then CEO of Glaxo-Smith USA (J.P. Garnier) had determined that civic leaders must adopt a renewed sense of urgency about the loss of ideas, graduates, Federal funding, and industry investment and that a review of the regional and statewide response to commercialization was required.

What the business - and in turn academic, entrepreneurial, public-sector and venture capital - leadership defined as success was a constant cycle of discovery-development-deployment for Greater Philadelphia - ten counties and three states (Delaware, New Jersey and Pennsylvania). No less than forming a series of 'Hot Teams' was the spark to engaging over five hundred individuals to establish business plans around the targets of unique competitiveness from the region's scientific and technological assets. A model was adopted across all the academic research and technology transfer operations in unison to achieving greater output from the Science Center, the Innovation Philadelphia programs and the reinvestment by corporate and philanthropic 'civic venture capitalists.'

Figure 12: Innovation Philadelphia Research Model





Four specific funding initiatives were created in Philadelphia that became statewide strategies as well (Figure 13 below):

- The Research Dollars Fund (leverage funding for federal grants, contracts, CRADAs, and SBIRs); and
- The Economic Stimulus Fund (investing in translational research and near-term market-ready later stage university research); and
- The MAG (angel capital commercialization funding with required partnerships among regional angel groups and associations); and
- The Mid-Atlantic Commercialization Corporation (an equity investment fund to partner with

corporate and other large-scale investors including bridge and IPO focused investors).

These staged programs included experienced staffing, advisory and mentoring working groups, expertise networks, and incubator-related support through existing programs such as the Ben Franklin program. Hand-offs were organized from one stage to the next, from one staff support expert to the next. Reporting of progress was done monthly, with annual reports on each program provided as any corporation would conduct.

Figure 13: Innovation Philadelphia Comprehensive Economic Development Strategy





Of additional note regarding the Innovation Philadelphia model was its role in advising two other national programs and thus forming a network of “common interests in commercialization.”

- **National Institute for Science and Technology Acquisition and Commercialization (NISTAC):** based at the Manhattan campus of the Kansas State University, a team of innovators, inventors and investors realized that the University was not producing enough intellectual property to address potential solutions for regional and state industry interests, nor investment opportunities for “deal-flow.” Therefore, NISTAC has worked with several major corporations and industry groups to identify neglected or under-valued intellectual property that could be

commercialized through additional research, development and market-analysis adjacent to the campus. The acquisition of patent rights for one under-valued consumer product alone resulted in 40 new jobs, revenues of \$25 million, and the expansion of the corporation’s R&D team to the region.

- **World’s Best Technology Network (WBTN):** launched initially as a technology showcase with the Arlington, Texas Chamber of Commerce, the University of Texas at Arlington, and the State of Texas, the Network has fast become a “commercialization” event for investors, inventors, and increasingly federal laboratories and corporate research divisions.



Texas - Emerging Technologies Fund

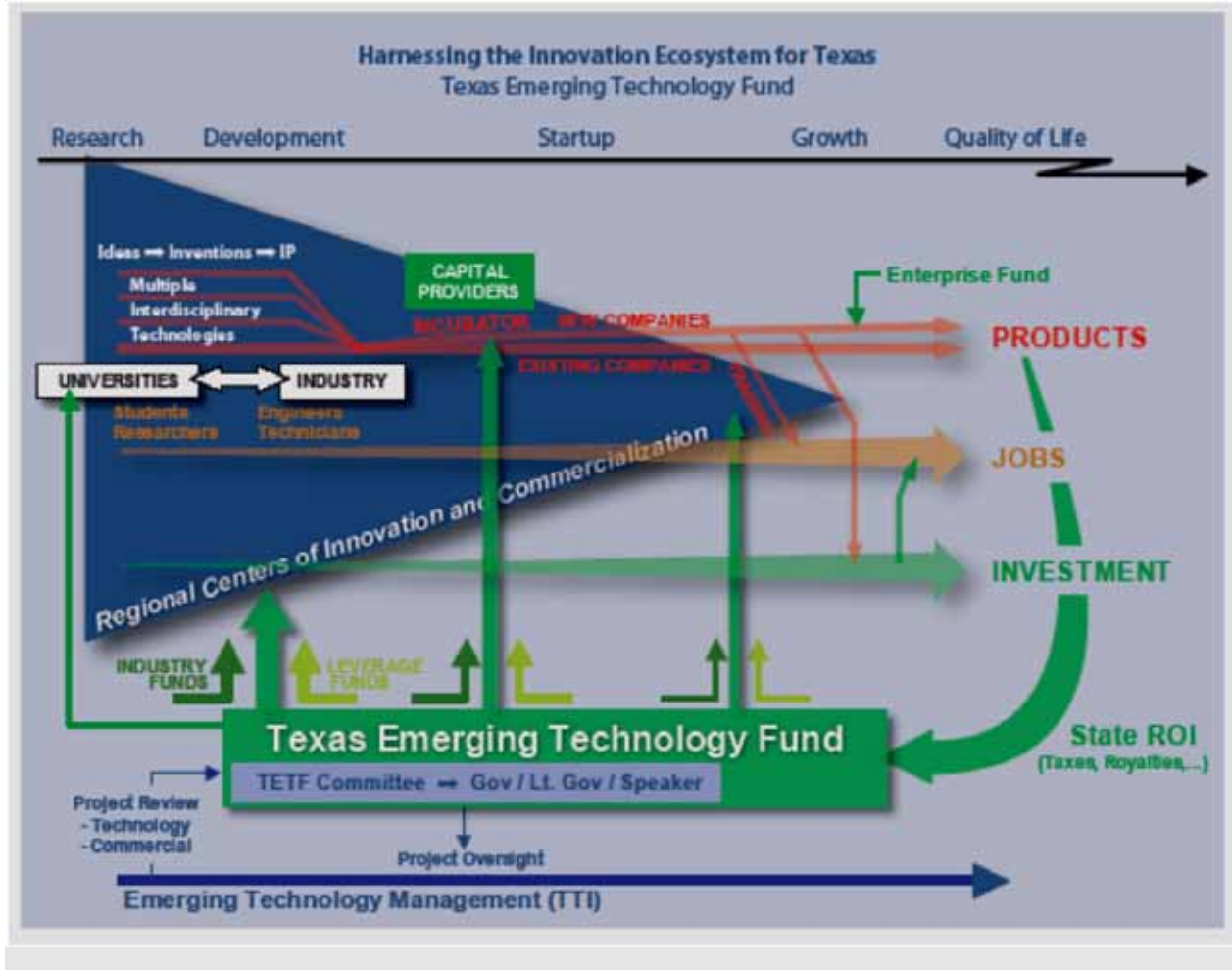
The State of Texas - with over \$21 billion in Federally-funded research - was not meeting its objectives for commercialization of ideas and products by its five major university systems and numerous research campuses, academic schools of medicine, and non-profit academic hospitals located in the State.

An inflection point was defined as “investing in early-stage ideas” that would attract top talent to Texas with the appropriate mindset for commercialization, not just basic research and teaching (Figure 14 below). Simply, Texas viewed early-stage

commercialization as THE vital spark for harnessing a new innovation and commercialization eco-system in partnership with industry, investors, venture capital and philanthropy.

While accessible to corporate and philanthropic wealth, mainly focused on infrastructure and facilities, scientists with commercial potential were leaving Texas for California, Florida, Massachusetts, New York and North Carolina to benefit from more willing investors and management expertise. And with all its significant wealth from energy, banking, and real-estate, Texas had only formed five certified venture capital firms, none focused on early-stage or academic research investment.

Figure 14: Texas Emerging Technologies Fund





In the early 1990s, the Texas Legislature had created a \$75 million Product Development Fund to address short-falls in early-stage risk capital for biomedical, energy and aerospace technologies. Nearly a decade later, deal-flow had only marginally increased for Texas commercialization activities and university offices of technology transfer. Several incubators and research parks had been formed, only to replicate research units already on the central academic campuses, without attracting national or global research, technology, manufacturing centers.

Therefore, with the examination of the State's entire community college, four-year research, and academic hospital assets - every square foot of research and laboratory space, specialized equipment and facilities, commercial and industry consortium and partnerships, industry sponsored research, philanthropic gifts and targeted funding initiatives, as well as identification of the State's top performers of R&D - state political and business leaders became acutely aware that THE critical ingredient missing for Texas was vital networks.

A key element of the newly created Texas Emerging Technology Fund with its \$250 million competition for grants and contracts, was the formation of

Regional Centers of Innovation and Commercialization (RCICs) dedicated to the technology themes identified in a statewide cluster report. Houston for instance leads the statewide biomedical, biotechnology RCIC, while North Texas is the location for advanced materials and nanotechnology. RCICs serve as regional intermediaries for linking and leveraging existing institutions, organizations, expertise and non-state resources for the formation of unique commercialization partnerships. Federal grants and contracts are attracted to multi-institutional and in some cases industry-academic teams that have formed around the RCICs as the means to accelerate translational research and discovery.

South Texas, along the Texas-Mexico border is a global location for manufacturing and logistics, while North Texas has expansive air, rail, and trucking infrastructure to national markets. Together, RCIC activities have connected two former competitors into a unique logistics and transportation consortia long the Interstate 35 corridor, and supported by the Texas Manufacturing Extension Partnership, a U.S. Department of Commerce program.



Section IX: Building an Innovative Nevada

There is admittedly much to be praised about the innovation-driven and commercialization-intensive successes from other states. What cannot be taken for granted, however, is that many of these programs were built upon significantly higher levels of academic research and development spending and greater public and private investment capacities than the current landscape in Nevada affords.

We therefore caution the State from attempting to replicate any other state's economic transformation model without addressing the fundamental and underlying challenges, barriers, and limitations specific to Nevada. To go from 'zero to sixty' through a whole-cloth adoption of the Georgia or Utah models, for example, is likely to be fraught with unintended consequences and unmet expectations.

One of the key findings of our research is that the scientific, technological, and innovative capacity found on both business and Federal campuses represents a significant pool of intellectual capital on which to leverage a model that could produce powerful commercialization outcomes. Meaning: Nevada needs to focus on investing in the people, teams and the opportunities that go beyond the current academic institutions. At the same time, strategic public investment in Nevada's higher education infrastructure and operations is critical to the State's ultimate success in reinventing itself.

This is not an "either/or" proposition; these strategies must work simultaneously and in coordinated fashion if Nevada is to experience an innovation-based economic renaissance. We must recognize that *Nevada is uniquely Nevadan* and that any model or external solution must acknowledge its unique assets and capabilities along with its current deficiencies and limitations. In addition, public-sector support for innovation and commercialization must be focused around a limited number of realistic clusters of demonstrated competencies as discussed in Section VII – Targets of Opportunity.

As Governor Brian Sandoval stated in his State of the State address on January 24, 2011:

"Innovation will drive tomorrow's economy, and so it must drive our decision-making as we rebuild our economic development infrastructure."

The challenge for Nevada is how best to deliver against three enabling objectives after giving realistic consideration to its related opportunities and constraints, including:

- Driving more public and private innovation in the State.
- Improving the State-wide commercialization ecosystem.
- Accelerating entrepreneurial activity throughout the Nevada.

The 'SILVER' Spark identifies one hundred (100) Federal, academic and non-profit laboratories, centers, institutes and consortium located throughout Nevada in Appendix E that currently provide extensive basic and applied research in significant market-making business-processes, software, technologies and tools. Nevada's research portfolio currently includes hundreds of patents with potential commercial value that can sustain five uniquely Nevadan targets of opportunity as discussed in Section VII, including:

1. Simulation, Modeling and Imaging
2. High Performance Computational Analysis
3. Mechanical and Electrical Engineering
4. Energy Assessment, Generation, Transmission and Operations
5. 21st Century Mining and Minerals

Literally billions of dollars of Federal research funds as detailed in Appendix C, along with additional monies from other public and private sector entities, have shaped these targets of opportunity over the past ten years. These are the seeds that have already been planted throughout Nevada. Successfully cultivating these seeds and harvesting the benefits will require more collaboration than previously possible. The systematic sharing of information across numerous boundaries will be critical to the success of the 'SILVER' Spark.

The principal of sharing has long been institutionalized in scientific research, and the philosophical concept of 'open source' for innovation communities predates the more recent

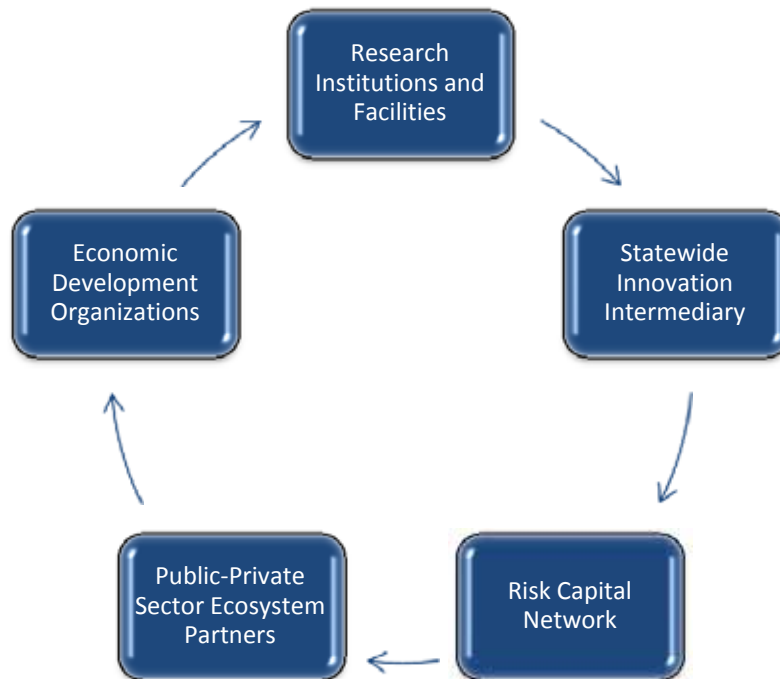


connection with software development. In his book, *“Open Innovation: The New Imperative for Creating and Profiting from Technology”*, Henry Chesbrough writes *“The central idea behind open innovation is that in a world of widely distributed knowledge, companies cannot afford to rely entirely on their own research, but should instead buy or license processes or inventions (i.e. patents) from other companies”*.

Collaboration at this level can be achieved by engaging five different categories of organizations in a statewide innovation and commercialization ecosystem as highlighted in Figure 15 below, including:

- Existing Federal, private-sector and academic research institutions and facilities across the State.
- A newly created statewide innovation intermediary.
- The statewide risk capital network.
- All of the other relevant public and private sector organizations with a presence in the State.
- The economic development organizations throughout the State.

Figure 15: ‘SILVER’ Spark Innovation and Commercialization Ecosystem





Nevada is uniquely positioned to become an 'Open Source Innovation State' by more closely connecting its statewide innovation and commercialization assets around the five targets of opportunity, discussed in Section VII, and actively engaging with a wider range of relevant public and private-sector entities to accelerate the formation of new companies and create jobs for Nevadans. If we take it, this is the moment to create a 21st century engine for change which is built to operate like a real-time incubator of ideas and new entrepreneurial ventures across the entire State.

Sparking Lift-off

The 'SILVER' Spark will lead to a vital economic renaissance in Nevada over a period of time by essentially repositioning Nevada as a reenergized hub of innovation and commercialization. To spark lift-off now and begin the journey to a more diversified, innovation-based economy, the following seven immediate actions are recommended:

1. *Provide state budgetary support to retain existing intellectual property producers within the Nevada System for Higher Education (NSHE) as well as the recruitment of faculty luminaries to vastly increase the production of commercializable research.*
2. *Appoint and sponsor a public-private "Innovation Intermediary" that will develop, launch and manage a statewide "Innovation Network" to coordinate and leverage the capabilities of the many individuals and organizations - including public and private educational institutions such as Sierra Nevada College - working in the State to accelerate the commercialization of ideas into sustainable enterprises.*
3. *Exploit short-term opportunities within industry and Federal government applied research laboratories (especially the Department of Defense) to accelerate existing innovations and competencies into new commercializable products and services.*
4. *Increase the economic development spend on attracting intellectual property, risk capital and management talent into Nevada, especially from California, by better leveraging and*

exploiting Nevada's competencies, supply chains and market opportunities.

5. *Pursue the development and support of physical or virtual technology "Accelerators" within "Centers of Innovation and Commercialization" located throughout the State to facilitate innovation, commercialization, company formation and the profitable growth of new industries.*
6. *Support the attraction of private sector risk capital (including seed, venture and other forms of private equity) through the creation of one or more State-led financing vehicles. Recognizing current constitutional constraints, pursue alternative funding sources (outside of the State's General Fund) such as the Nevada Public Employees Retirement System, Permanent School Fund, and the Unclaimed Property Fund.*
7. *Support the attraction of Federal research and development dollars through the formation of a research leveraging program to organize, draft, apply, and provide required cost-share funds to win these programmatic dollars throughout the State.*

There is no better time than the current to advance any required legislation to effectuate the foregoing foundational actions. Further encouraging the Governor to take the lead in transforming the economic model of the State, along with actively engaging the leadership of the Legislature, will spark the growth engines for investment and employment by branding Nevada as the location of choice for innovation and commercialization within the five targets of opportunity and beyond.

'SILVER' Spark Innovation Intermediary

The appointment and sponsorship of an "Innovation Intermediary" to develop, launch and manage statewide commercialization support infrastructure is the first critical enabler of the 'SILVER' Spark. Unlike Innovation Philadelphia, Team Orlando or USTAR, there is currently no statewide organization in Nevada that has been empowered to provide this essential layer of coordination across multiple technology domains.

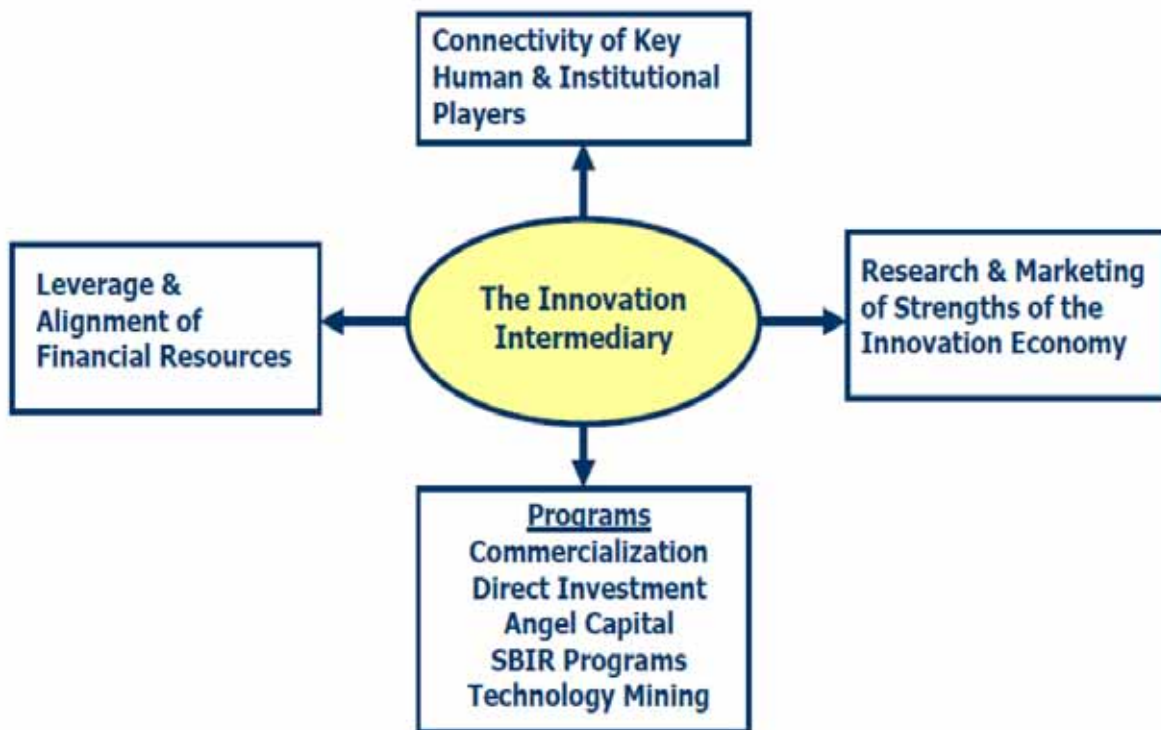


Further developing a new innovation vision for Nevada, building a supporting strategy, evolving the required tactics and ensuring that the 'SILVER' Spark produces measurable results is not a small task. The role of the Innovation Intermediary as illustrated in Figure 16 below requires deliberate and focused

execution to successfully drive results. Moreover, Nevada must better align its current intellectual property and capacities with those firms most in need of new ideas, solutions and unique testing, evaluation and manufacturing capabilities.

Figure 16: Role of the Innovation Intermediary

21st Century Innovation Intermediary: Operating Model for Regional Economies





With State financial support and oversight, the nascent innovation and commercialization ecosystem-building efforts of such existing organizations as C4Cube, NCET, NevBio, the Nevada Alliance, NIREC, Nevada Small Business Development Center and REA250, and/or other new sectoral-specific commercialization-focused organizations, can be more synergistically aligned toward a common set of desired economic development outcomes built around the five targets of opportunity identified by the 'SILVER' Spark.

New 'Centers of Innovation and Commercialization' organized by the Innovation Intermediary around the five targets of opportunity would assume responsibility for engaging all of their relevant communities, including academic institutions, businesses, chambers of commerce, civic leaders, economic development organizations, Federal entities, State and local government entities, philanthropic organizations and workforce development organizations in an open source effort to advance efforts to address local, national and global challenges. The results of such an effort would lead to the innovation and commercialization of solutions to problems with marketable benefits.

Pursuing the development and support of physical or virtual technology "Accelerators" within each of the Centers of Innovation and Commercialization to be located throughout the State will facilitate more innovation, commercialization, company formation and the profitable growth of new industries

To further ensure that the 'SILVER' Spark is successfully implemented and ultimately meets expectations, we also recommend the formation of the **Innovation Advocates** – a leadership group comprised primarily of innovators, investors and high-profile civic 'stewards' that are charged with working together to promote Nevada's economic competitiveness by reducing previously intractable organizational and political barriers and assisting in leveraging the relevant assets of the entire State.

Appointing and sponsoring an "Innovation Intermediary" charged with developing, launching and managing a statewide commercialization support infrastructure and adept at coordinating and leveraging the capabilities of the many individuals and organizations already working in the State will accelerate the commercialization of ideas into sustainable enterprises.

Engaging Nevada's Colleges and Universities

Pursuing initiatives that go beyond investing in the traditional academic campus model to effectively create a 21st century academic research "enterprise" should be considered as well; an enterprise that collectively operates like a real-time incubator of ideas, with students and faculty driving innovation with the active support of business, civic, entrepreneurial, investor and government leaders.

Advancing the concept of innovation programs, certifications and degrees in the five targets of opportunity will allow more Nevadans to get involved in the process of discovery, development and deployment. This could be accomplished by:

- Creating networks of academic, business and government problem-solvers to utilize the research campuses as laboratories and incubators of fast-paced, just-in-time testing and evaluation for commercial and societal purposes.
- Connecting research enterprises with the certification programs at the community colleges by identifying how Nevada will produce the next generation of students and inventors in accelerated two-year career pathways rather than the traditional four-year programs.
- Converting the traditional four-year engineering degree to a two-plus-two initiative whereby a student achieves all of their depth in engineering in their freshman and sophomore years, and then concentrates their remaining years as interns, field engineers and inventors in close collaboration with industry partners.
- Constructing a 'Nevada Science and Technology Apprenticeship' that sparks learning, inventing, and commercializing for students with faculty as co-partners and incorporates team members from industry consortium and backed by Federal dollars.

Engaging scientists, technologists, inventors, innovators, and investors statewide who are deeply engaged in solving important problems, as well as with key business, civic, government and philanthropic decision-makers interested in seeing them resolved, will only serve to enrich the



promotion and branding of the State’s innovation capabilities.

Strengthening the Risk Capital Network

Transforming Nevada’s economy will take a significant amount of public-sector will-power and private-sector engagement and financial resources to ultimately create jobs beyond the gaming, hospitality and mining industries. This is especially true in addressing one of the longstanding challenges associated with forming and building new companies in Nevada - the lack of a vibrant risk capital network.

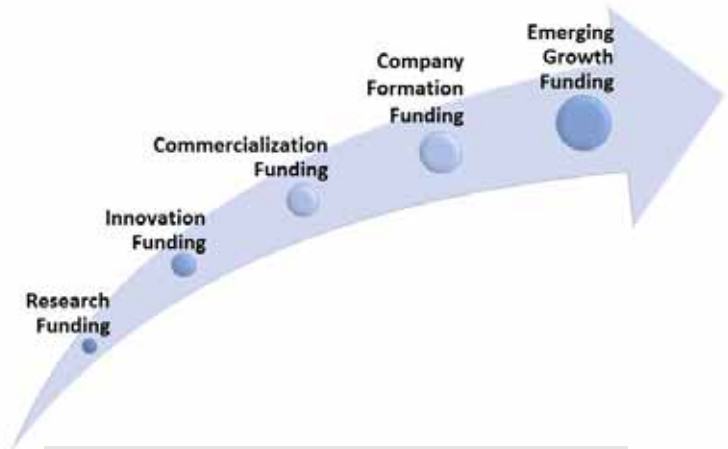
Nevada’s venture capital community is essentially comprised of a collection of individuals, initiatives and trusts, three known early-stage investment groups, including the Vegas Valley Angels, the Reno Angels and the Sierra Angels, and only one known National Venture Capital Association member firm – Redhills Ventures, LLC which is located in Las Vegas and focused on making healthcare-related investments.

Not surprisingly, Nevada does not have any local or statewide venture capital organizations. Numerous states and regions across the country not only have considerably more robust venture capital communities, but they have organizations designed to actively engage their member firms in fostering and supporting an entrepreneurial culture. Nevada needs to foster the creation of its own risk capital engine.

We must pursue all available avenues for “investment” including taking advantage of federal programs that other states have used to advance their innovation agendas: Small Business Innovation Research (SBIR) research grants, Cooperate Research and Development Agreements (CRADAs), and the full complement of the procurement process that connects Department of Defense, Energy, Interior and other agencies residing in Nevada to our targets of opportunity.

Creative solutions are required at all five stages of funding, including research, innovation, commercialization, company formation and emerging growth as illustrated in Figure 18 below.

Figure 17: Risk Capital Network



As discussed in Section VIII - Best Practices, each of the state initiatives reviewed therein were seeded through some level of sustained public sector investment with significant private sector investment to follow. Nevada will have to do the same through passage of a set of key legislative solutions to create new pools of collaborative public-private investment to support research, innovation, commercialization, company formation and the growth of newly emerging companies.

Longer-Term Objectives

Based on the review of competitor states and regions across the U.S. (including Alabama, Arizona, Florida, Kansas, Louisiana, Maryland, Ohio, Pennsylvania, Tennessee, Texas and Virginia among others) and a handful abroad (Australia, Canada, Ireland, Mexico, Scotland and the United Kingdom), the following three longer-term objectives are **suggested for further discussion and review subsequent to the implementation of the ‘SILVER’ Spark**, including:

Becoming the Go-To Location for Business Relocation, Expansion, and Consolidation

This is critical because Nevada must expand its business engines for employment and investment by communicating and branding the State as a location of choice by those sectors most aligned to the five targets of opportunity and supporting assets. To create an economic rebuilding strategy, Nevada must better align its current intellectual property



and capacities with those firms most in need of new ideas, solutions, and unique testing, evaluation and manufacturing capabilities.

Potential Tactics:

Targeted sector value chain recruitment; Leverage clusters of knowledge across interdisciplinary capabilities of academia and industry; Identify and recruit anchor tenants of science and innovation to Nevada's research facilities and parks.

What is Required:

Encouraging the Governor to transform State and regional economic development strategies and tactics by assessing the current delivery of economic development services while at the same time sparking the focus and work of the private and academic sectors in the vital agenda for recruitment and attraction among their C-level relationships.

Building an Online Innovation and Commercialization Network of Academic, Business, Federal, and Entrepreneurial Innovators—both living in Nevada or alumni of Nevada institutions and organizations

Ending anonymity among scientists, technologists, inventors, innovators, and investors internally and among Nevadans, as well as with key decision-makers at the corporate and industry levels, will improve the promotion and branding of the State's innovation outcomes.

Potential Tactics:

Create a virtual online space for linking in-state Nevadan innovation and commercialization interests

with external partners, alumni, and investment groups to accelerate exposure of the State's sources of ideas, products and services.

What is Required:

Build and launch the online space through existing or alternative digital media sources in collaboration with emerging business, government, investor and philanthropic interests; move beyond just posting patents and available IP.

Sparking Youth and Student Innovators through Focused Education and Workforce Initiatives

This is critical because Nevada's slow slide in critical STEM scores and graduation rates for high school and college foretell an emerging gap in meeting the future demands for talent and workforce. Given the State's historical science and technological expertise, resulting engagement between students, mentors, and industry expertise needs to be more organized.

Potential Tactics:

Form the Nevada Skills Continuum among economic development agencies, education, program, service and workforce providers with a special emphasis on mentoring, tutoring, interning and launching of capabilities, ideas and knowledge.

What is Required:

Create the Nevada Business-Education Roundtable to design a framework for unique education experiences around science and technology, as well as integrating the current efforts of the EPSCOR and STEM coalitions across the State.



Section X: Ensuring Success

Overcoming Possible Barriers

First and foremost - the current investment and resource allocation limitations placed in the State's constitution no longer serves current or future generations of Nevadans. By way of stark example, Mexico's constitutional limitation on 51% ownership of lands or even intellectual property by non-Mexicans has kept their institutions and organizations from reaching the nation's full economic potential. Simply, there are several proven strategies and models that allow for Nevada to invest in risk-capital programs and companies while protecting the long-term value of taxpayer resources and public trust. Removing the language or administering a new model for State resource investment in Nevada's targets of opportunity outlined herein would jump-start a flow of funds to the State's coffers through new revenues from new sources.

Second, highly focused multi-year resource allocations are critical to sustainable and consistent investment activities. No institution or organization can plan in twelve-month increments against global competition that has set out multi-year implementation plans with billions of public and private sector monies. Therefore, fundamentally any new Nevada programs created by executive and legislative concurrence must be protected for at least five years along with defined, transparent, and constant reporting of progress, outcomes, and return on investment results.

Third, leaders in both the public and private sectors must come to realize that academic research enterprises are the critical assets of a knowledge economy – one which is absolutely critical to the transformation of the immediate and long-term economic condition of the State. And in turn, if the role of the community colleges, four-year institutions (public and private), graduate and post-graduate research institutions, industry and government operations are not adequately incentivized and rewarded for collaborative commercialization outcomes, then such institutions will not succeed in driving the economic transformation Nevada's citizens require.

Fourth, the selection of an "Innovation Intermediary" as discussed above is critical to driving implementation of the 'SILVER' Spark. With the

potential to vastly increase the focus of economic and workforce development in the State around innovation and commercialization, this State-sponsored group is designed to connect the 'dots' will help to ensure that the 'SILVER' Spark isn't just another document that collects dust on a shelf.

Measuring Results

Numerous prior initiatives, roundtables, working groups, and advisory councils examining options and solutions on any number of Nevada's economic challenges have been convened to discuss the data and the findings from such important work emerging from efforts such as Brookings Mountain West at UNLV, the Nevada Vision Stakeholders Group, the New Nevada Task Force and Reno 2020 at UNR. If efficient use of time and resources are to be allotted to resolving Nevada's innovation and commercialization challenges and exploiting its advantages, **now is the time to bring together several common threads for agreement on goals, objectives, and most importantly, accountability for implementation through agreement on the indicators and metrics requiring attention.**

Sample metrics, indicators and performance measures of Nevada's capacity to innovate through commercialization aligned with the targets of opportunity going forward could include the following:

Research Input:

1. Increase in federal funding of grants, contracts, CRADAs and SBIRS into targets of opportunity technologies, sectors, and basic-applied research programs, facilities, and infrastructure.
2. Increase in private sector, industry, and sector consortium of principal investigator teams, chairs, collaborations, and new partnership models.
3. Number of new academic-federal laboratory/program initiatives through competition, sole-source contracts, and/or outreach engagement by Department of Defense, Energy and Homeland Security.



4. Increase in philanthropic grants, gifts, and capital investments to multi-campus partnerships.
5. Number of multi-campus, multi-partner grant or contract applications for administration or congressional competitions in key sectors or target of opportunity scenarios.

3. Donated or co-purchased high-end equipment necessary for attracting top researchers, scientists, inventors and innovators as element of Nevada-based consortium.
4. Establishment of select incubators and commercialization parks (not research parks) specific to the targets of opportunity.

Educational and Workforce Input:

1. Number of high school graduates taking advanced placement math, science and technology related courses.
2. Number of community college graduates with associate degrees or certificates in key support occupational programs and skills' lattice related areas of interest.
3. Number of four-year college, post-graduate, and doctoral program graduates in key areas of science and engineering related to targets of opportunity.
4. Number of workers participating and graduating from programs leading to new opportunities in key sectors and related target of opportunity skills-related functions (conversion rate from traditional skills to new skills).
5. Number of internships, externships, apprenticeships and immediate graduating opportunities for Nevadan high-school and college students in target of opportunity enterprises.

Commercialization Outputs:

1. Increase in high-ranked, market-valued patents based on academic-industry co-assignees and inventors - not just number increase of disclosures and patents filed.
2. Increase in side-by-side co-investments of Nevadan and non-Nevadan seed, early stage, mezzanine and IPO-related capital.
3. Number of products, services, tools and other outcomes generated in Nevada leading to firm formation in-state versus out-of-state.
4. Number of federal or global centers of R&D production located in Nevada as a result of new products or technologies commercialized by Nevadans.
5. Increase in profitability of Nevadan and U.S. firms based on Nevadan technologies, solutions and commercialized products.
6. Increase in angel capital, risk capital, and investor-related management, expertise, business services located in Nevada serving the commercialization arena around the targets of opportunity.

Infrastructure Input:

1. Amount of upgraded or new facilities, equipment, and related operating centers on competitive par with other national centers of excellence.
2. Number of corporate or industry invested testing, evaluation, simulation and/or advanced manufacturing operations sited adjacent to or within proximity of academic and/or federal facilities.

Societal and Citizen Benefit Outputs:

1. Reduction in illness, disease, and/or health related problems based on Nevadan products, technologies, solutions and offerings.
2. Increase in personal incomes resulting from employment in target of opportunity sectors, spin-offs, secondary impacted jobs, etc.
3. Increase in the State's gross domestic product resulting from new firm formation, expansion



- of national and global enterprises, attraction of production and manufacturing operations, high net-worth individuals, and increases in purchasing power of corporations and industries related to targets of opportunity.
4. High-wage employment increases.
 5. Technology-based traded industry sector increases.
 6. Increase in positive attitudinal measurement towards Nevada's economy, employment opportunities and overall quality of life related to economic well-being.



Conclusion

Nevada has a challenge. It needs to create more jobs, and preferably new economy jobs that can offer Nevadans higher salaries and better benefits. Jobs that generate incomes sufficient for Nevadans to buy new houses and cars, shop at local stores and eat at local restaurants, use local service providers, help ensure that families can send their children to good schools and colleges and save for retirement. Jobs that generate the tax revenues desperately needed to support State and local government.

As U.S. Senator Harry Reid stated in his address to a joint session of the Nevada Legislature on February 22, 2011 –

“I didn’t come here to talk about the past ... I’m here to talk about our future: how we will move Nevada forward. How we will seize this unique, rare and critical opportunity to lead not just the nation’s economy, but the world’s”. He further added that “The question is whether we will direct our destiny, or forfeit our future ... The day to grow new jobs, attract new business, raise a strong generation and breathe life into our economy is today, if we take it”.

There is admittedly no silver bullet to accomplish what Senator Reid has suggested, but there is a ‘SILVER’ Spark. A pragmatic initiative in which sustainable innovation can lead a vital economic renaissance in Nevada by better leveraging an impressive array of assets positioned throughout the State. Throughout Nevada, the seeds have already been planted for a better future. We must, however, seize the moment and muster the political will to take the immediate steps recommended in the ‘SILVER’ Spark to ignite “lift-off” and begin the journey to a more diversified, innovation-based economy.

That being said, innovation is not about technologies or products, not just cool ideas and awestruck bumper-stickers. Innovation is about unleashing the capabilities of Nevadans to solve national and global problems, to create a set of solutions for society’s greatest challenges in health and energy for instance. Commercialization is the means to have

any Nevadan link their ideas to markets, to connect with another Nevadan to form a company that could be purchased outright by a global corporation, or to leverage Federal investments at military bases to the needs of industries seeking to find something that will improve their margins and profitability.



Innovation and commercialization, as outlined in the ‘SILVER’ Spark, has the promise to accelerate national and even global companies’ profit growth by tapping Nevada’s best minds, teams, and infrastructure.

During the Nevada 2.0 Conference in Las Vegas on January 7, 2011, Lt. Governor Brian Krolicki, Senate Majority Leader Steven Horsford and Assembly Speaker John Ocegüera collectively communicated the growing necessity to transform Nevada - and to do it now. And speaker after speaker repeatedly echoed the same theme.

The ‘SILVER’ Spark seeks to focus this discussion on a set of opportunities and recommended actions that acknowledge where Nevada has been, where it is currently and where it must give attention in the future to be a competitive economic engine for all Nevadans. No other region, state, nor country is waiting for Nevada. The advances in competitiveness through scientific, technological and business transformation have created a constant form of turbulence in the economic cycles of profitability and prosperity. However, if Nevadans focus on those actions and implementation steps suggested herein, such turbulence can be leveraged into opportunity.

As discussed in Section III and detailed in Appendix F of this report, twenty-five studies completed over the past ten years have looked at Nevada from a variety of perspectives and subsequently



recommended actions to diversify Nevada's economy around an assortment of innovation-based strategies. The recently completed work of the New Nevada Task Force specifically emphasized the importance of innovation and commercialization and recommended the implementation of a USTAR-like initiative for Nevada. The authors of the 'SILVER' Spark readily acknowledge the work of so many others across the State, and we share their communicated desire to take control of our destiny as Senator Reid and so many others have recently suggested.

As Governor Brian Sandoval stated in his State of the State address on January 24, 2011 - *"Innovation will drive tomorrow's economy, and so it must drive our decision-making as we rebuild our economic development infrastructure"*. The 'SILVER' Spark is admittedly not all-encompassing and is therefore not meant to singularly drive Nevada's entire economic development strategy. Nevertheless, it is designed to help:

- Drive more public and private innovation in the State.
- Improve the State-wide commercialization ecosystem.
- Accelerate entrepreneurial activity throughout the Nevada.

The 'SILVER' Spark identifies one hundred (100) Federal, academic and non-profit laboratories, centers, institutes and consortium located throughout Nevada in Appendix E that currently provide extensive basic and applied research in significant market-making business-processes, software, technologies and tools. Nevada's research portfolio currently includes hundreds of patents with potential commercial value that can sustain five uniquely Nevadan targets of opportunity, including:

1. Simulation, Modeling and Imaging
2. High Performance Computational Analysis
3. Targeted Mechanical and Electrical Engineering
4. Energy Assessment, Generation, Transmission and Operations
5. 21st Century Mining and Minerals

Literally billions of dollars of Federal research funds, along with additional monies from other public and private sector entities, have shaped these targets of opportunity over the past ten years. These are the seeds that have already been planted throughout Nevada. But as with any seed, failure to foster a favorable environment for growth will result in a less than desirable outcome. While the scientific, technological and innovative capacity found on both business and Federal campuses in Nevada represents a significant pool of intellectual capital to be harvested, as the philosopher Alfred North Whitehead said, *"Universities create the future"*.

The book *'Engines of Innovation'* published in 2010 makes *"the case for the pivotal role of research universities as agents of societal change"*. Accordingly the strength of the Nevada System of Higher Education, and its member institutions, is directly correlated to the competitiveness of Nevada in a knowledge-based world. Failure to adequately recognize, embrace and support our public education and research institutions - and private entities such as Sierra Nevada College - will significantly impair Nevada's ability to build and sustain a new economy based on innovation and commercialization.

Notwithstanding the foregoing caution, however, Nevada is uniquely positioned to become an 'Open Source Innovation State' by connecting its statewide innovation and commercialization assets around the five targets of opportunity put forward in the 'SILVER' Spark. If we take it, this is the moment to create a 21st century engine for change which is built to operate like a real-time incubator of ideas and new entrepreneurial ventures across the entire State. An incubator that engages entrepreneurs, faculty, inventors, researchers, scientists and students with the active support of business, civic, entrepreneurial, investor and government leaders throughout Nevada.

Rather than attempting to replicate another state's economic transformation model, the 'SILVER' Spark recommends that Nevada become a rebranded version of its pioneering character by having the entire State become a collaborative, integrated and globally-networked ecosystem for innovation and commercialization. This strategic approach to reclaiming Nevada's innovation brand will spark the transformation long recommended by so many to



diversify the State's economy and create new economy jobs for Nevadans.

Change of this type admittedly comes with a cost. And the authors of the 'SILVER' Spark are understandably sensitive to the fiscal reality that Nevada is currently struggling to address. Ingenuity, however, is about more than sparking innovation and commercialization. It is about finding creative solutions to ultimately solve a wide range of problems. One interesting example is the unique public-private funding model developed by the Culinary Training Academy in Las Vegas wherein a private-sector contribution of three and a half cents (\$0.035) per hour is multiplied across a very large number of hours worked by culinary-classified employees thereby generating millions of dollars to ensure a qualified workforce.

While funding recommendations are beyond the scope of the 'SILVER' Spark, the anecdotal evidence suggests that private-sector entities are willing to work with the public sector to develop creative solutions to the State's current funding challenges.

As shown throughout this report, Nevada has the individuals, institutions and assets with significant capacities to innovate. And yet we have focused for far too long on the traditional application of economic and workforce development practices. We have the capacities to network our 'brain-power' if we will only look through a new lens and perspective about what Nevada can truly be in comparison to the rest of the Nation. Simply, it is time for Nevadans to design, implement and manage their own future rather than letting the future happen to them. Nevada has never failed to do whatever has needed to be done to continually re-invent itself in response to challenge after challenge ever since achieving statehood in 1864.

As Governor Sandoval concluded in his State of the State address:

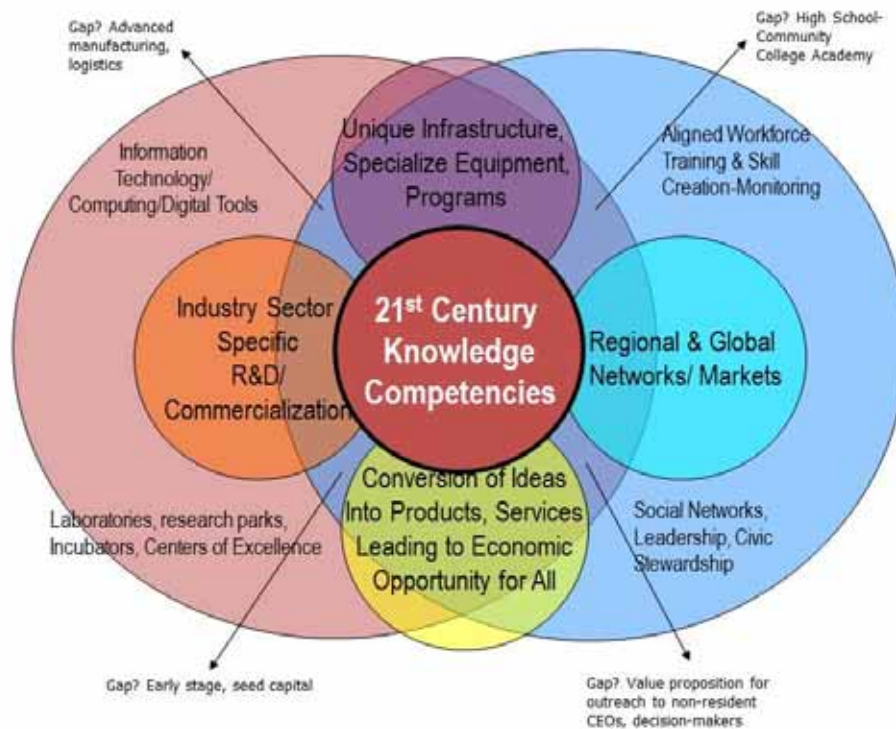
"We are leading the Nevada family onto a new path, and I submit that it is one of progress and ultimate prosperity. If we have the courage to make the tough decisions, and there will be many, we will succeed".



APPENDICES

Appendix A: Asset Mapping

Figure 18: Connecting Innovation Assets as Competitive Advantage for Regional Progress



Many prior reports, presentations and forums have called for a mapping of Nevada’s assets; we have attempted an initial inventory in creating the ‘SILVER’ Spark. There are numerous, rich and robust assets for addressing both the transformation of the State’s economic engines AND immediate diversification. The diagram above provides a Gap Analysis through key questions around the vital elements of the innovation process including how these gaps once filled will align to ease the hand-off from one stage of progress to the next. We have examined a number of online resources at the State and local levels where some – not all – of Nevada’s current assets can be located. Completing an annual or quarterly inventory of relevant assets and making it available electronically should be a focus of the Innovation Intermediary.

Innovation assets can be sub-categorized by the similar methodology of the U.S. Council on Competitiveness, including:

- Infrastructure
- Intellectual Capital
- Human Capital
- Financial and Investment Capital
- Connectivity-social Capital.



In applying these five categories to the current Nevada innovation and commercialization scenario, it becomes evident that if compared to other states, a series of gaps and missing building blocks can be found in the landscape. However, one must be willing to step back from the comparative analysis so as to recognize that Nevada has several unique assets that just require more effective and efficient use, partnering, and coordination.

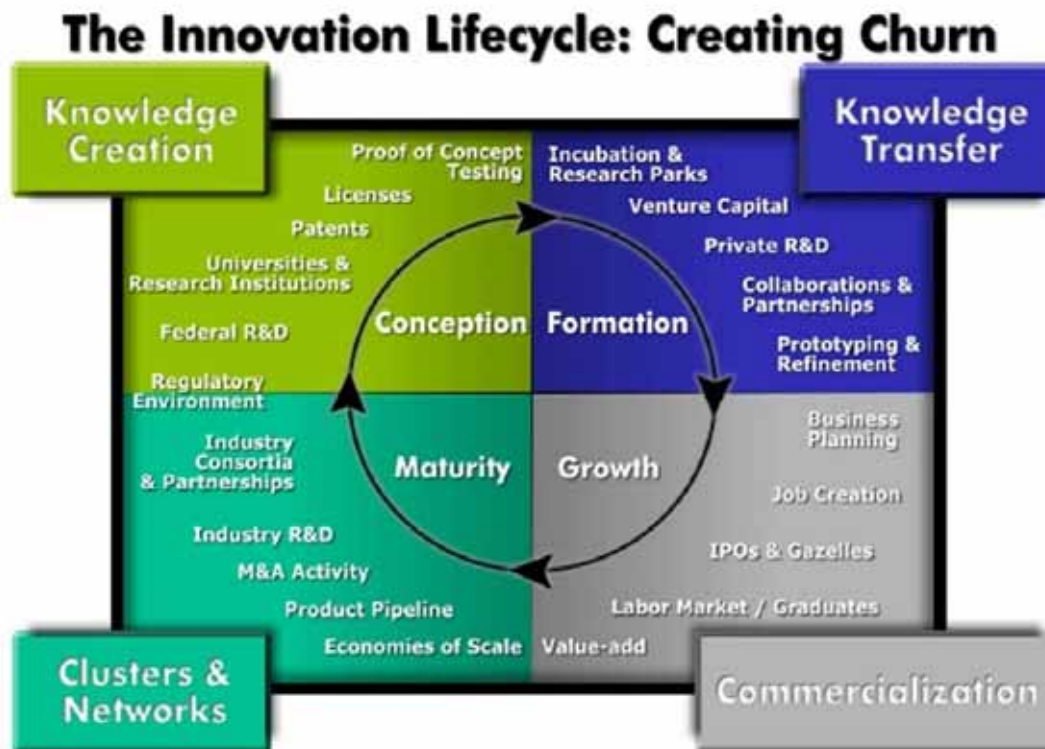
One could easily showcase several assets based on location and proximity using a GIS mapping tool, but even such presentation does not tell the Nevada 'innovation story.' The importance of asset mapping is to identify how well these elements link and leverage with each other, how well they perform by increased connectivity, and as such how these assets increase profitability and/or expected results for the end-user.

Based on experience in over 100 different nations, regions, and states, the measure of performance for Nevada's assets would be:

- **Infrastructure (High)**
Assessing Federal, State, local, academic and industry infrastructure – including access to land, facilities, operations, and transportation - Nevada has many positives (the DOE-DOD bases, the commercial airports, unique teaching and research facilities, and existing and emerging corporate manufacturing and operating sites). Yet, those pieces of infrastructure most vital to an innovation-based economy are only now being aligned to create a new generation of ideas, solutions, products and services for a 21st century global market. The State must continue to invest in the academic-research enterprise and find ways to leverage additional non-state resources into upgrading facilities and equipment.
- **Intellectual Capital (Medium)**
Surprising to many readers will be the grading of Nevada's intellectual capital capacity as positive rather than cautiously concerned. However, among the academic research enterprise can be found nationally and globally prominent scientists and investigators, as well as highly regarded technical partners. In turn, within corporate Nevada as well as the defense and energy Federal sector, there are numerous individuals and teams with significant capacity to produce new solutions to market challenges and product demands.
- **Human Capital (Low)**
Troubling for Nevada is not the existing employment base of skilled workers, but the pipeline issues for meeting future demand in key areas of science, technology, engineering and math (also known as "STEM"). Further challenging to the Human Capital component is the lack of focus on engineering capacity building and related fields of critical thinking applied to key areas of economic growth. With its access to several Federal and defense-related facilities and laboratories, Nevada has a plethora of STEM resources during a time when the national focus on increasing reading, math and science scores for 4-8-12th graders is at its highest awareness.
- **Financial and Investment Capital (Medium)**
With immediate access to all forms of capital by its proximity to California, as well as the base of Nevadan wealth, one would consider the State to be a stronger magnet for risk capital funding and early-stage venture resources. Though a number of angel networks have been formed, incubators launched, and entrepreneurial mentoring and assistance are available, the level and depth of management talent for startups and growth firms is lacking. All the same, there are a number of individuals with significant investment expertise.
- **Connectivity Social Capital (Medium)**
Though there is some residual of the north-south divide in Nevada, increasingly the networks within regions and now across the State have begun to exercise a willingness to collaborate and align mutual interests for advocacy, planning, and knowledge-sharing around transforming and diversifying the economy. Yet there is still – even in a state the size of Nevada – too much anonymity among key participants in science, technology, innovation and commercialization.



Figure 19: The Innovation Lifecycle



Finally, we examined the clusters of knowledge and the targets of opportunity through a unique lens - the Innovation Lifecycle in Figure 19 above. The Innovation Lifecycle details a constant, churning engine of investment, activities, infrastructure, and people necessary to move ideas to the marketplace for growth and prosperity. In our assessment, the Nevada engine is stuck in the Maturity quadrant, and requires stronger linkage with the Conception (Knowledge Creation) and Formation (Knowledge Transfer) quadrants for accelerating job and wealth generation.

Conception/Knowledge Creation: Nevada has had a historical role in the conception of new ideas and solutions to meet national challenges. However, without a steady and stable flow of investment into the research and discovery engines of the State, without advancing the infrastructure and facilities of both State and Federal entities as the bases for new research, the conception of ideas and products is episodic and periodic.

Formation/Knowledge Transfer: the formation of new enterprises, solutions for existing companies, forming collaborations and partnerships has not leveraged access to private sector R&D nor patenting, nor prototyping and refinement of products in the design and manufacturing process - even though assets exist in abundance

Growth/Commercialization: increasingly a number of regional organizations have begun to press the point about commercialization including access to business planning, mentoring, incubating and converting ideas to market-making opportunities. The lack of identified capital – early-stage, risk, and product development funding – minimizes outcomes

Maturity/Clusters & Networks: though rich and robust assets have and still exist in Nevada, the connectivity among and between sectors, capabilities, and industry demands is weak. Therefore, we advocate less about industry clusters and more about networks. This must be the objective of the Innovation Intermediary as suggested in the 'SILVER' Spark.



Appendix B: Shifting Clusters

Over the past decade, Nevada has adopted an industry cluster model based on the work of Harvard University’s Michael Porter that had examined robust economies around the United States. Previous studies at the state and regional level have already identified the clusters and sectors on which Nevada’s economy has evolved. Currently the Hospitality and Gaming Cluster in Nevada has successfully attracted and built a value-chain of companies, suppliers, and talent to serve the needs of the global and national visitor, conference and convention attendee, and families. The Mining and Mineral Extraction Cluster has continued to evolve its State-wide profile in light of global competition from Australia, China and other nations; all the while the Construction and related Housing Sectors have taken a sharp decline and will emerge to a lesser degree.

The traditional perspective of the Nevada economy has been viewed through the lens of the industry cluster approach – aggregates of employment and wage concentration. The larger the size of the ‘bubble’ the larger its share of the overall Nevada employment, and the higher to the top right the bubble is placed, the more concentrated the national share of employment in that sector for Nevada. We recognize that several of these ‘bubble charts’ have been presented in prior reports; what we are seeking is the portfolio of opportunities that can be found in integrating sectors, clusters, and most importantly knowledge.

Figure 20: Nevada Cluster Employment Projected Growth

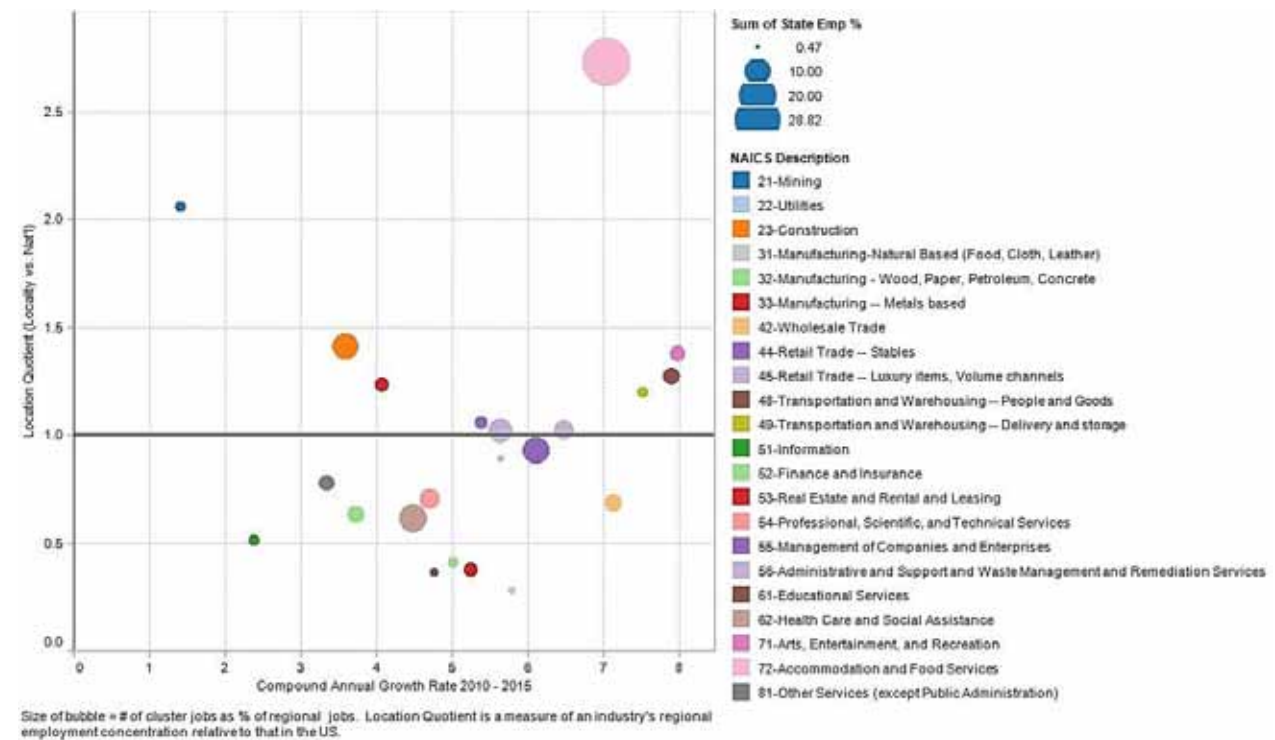
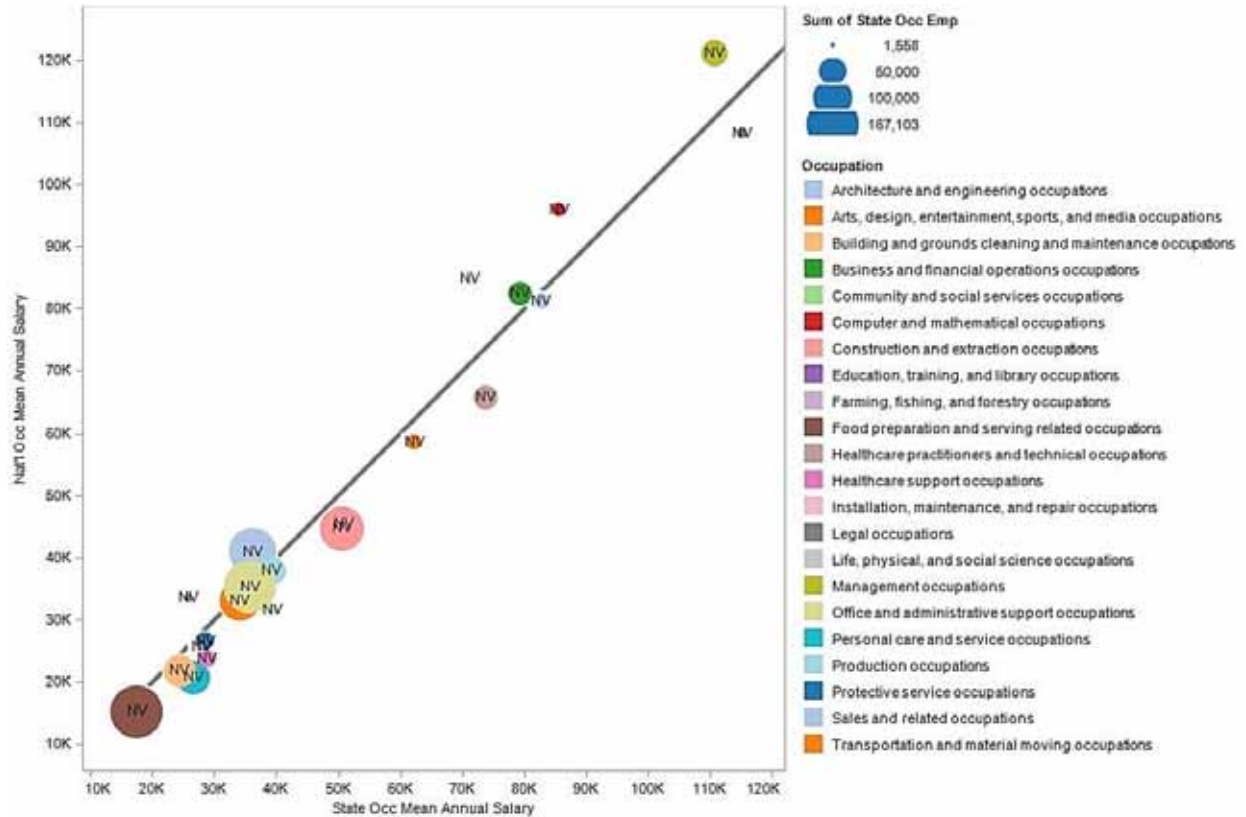




Figure 21 below shows the broad spectrum of occupations throughout Nevada, but also proves that lower wage positions have not created long-term growth prospects for the State’s overall economy nor the creation of a portfolio of high-wage, high-technology positions, even with its historical brand from the 1950s and 1960s.

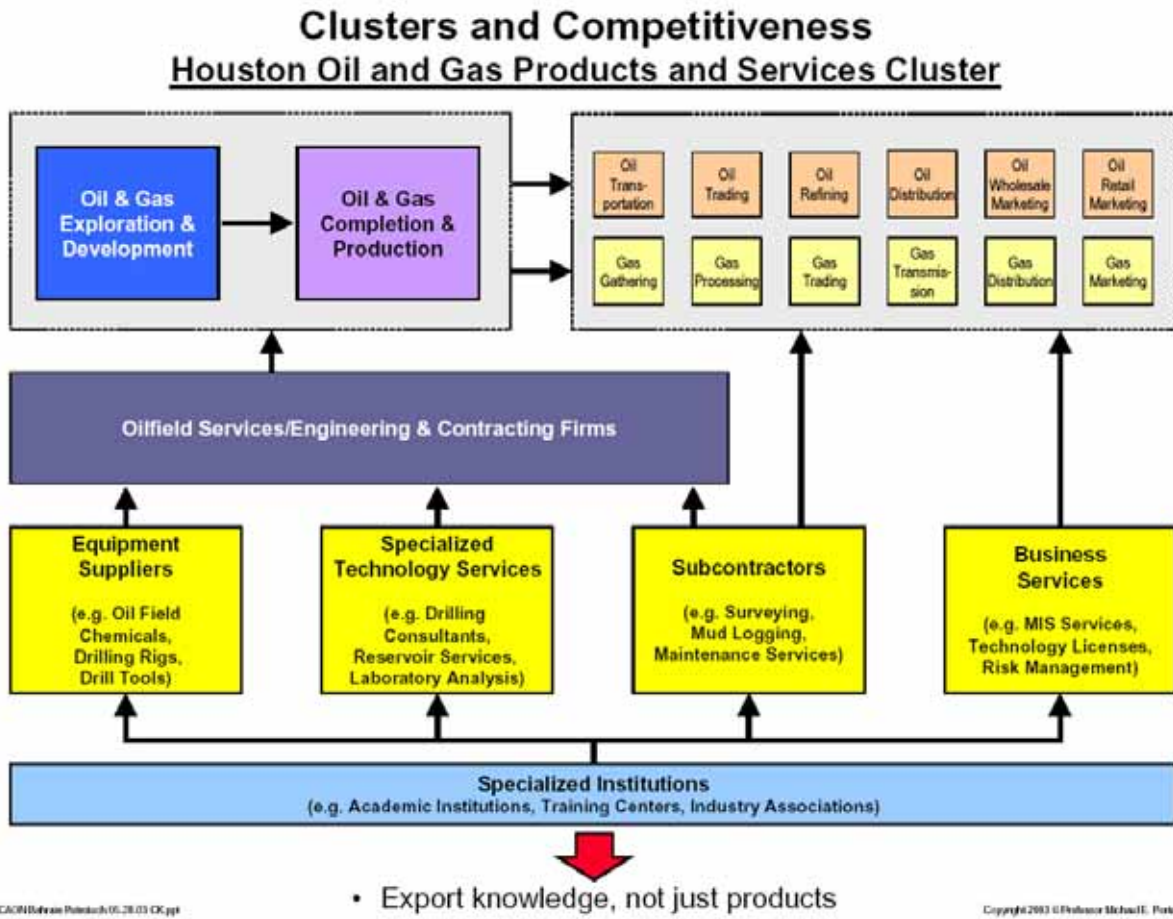
Figure 21: Nevada Occupations by Average Salary





Yet in reviewing these various occupations, one begins to identify the skill-sets and talent existing in Nevada that, once organized around teams focused on specific and unique advantages in scientific, technological opportunities, the future of Nevada is much brighter than being described currently.

Figure 22: Clusters and Competitiveness



Clusters, using the Harvard model, are aggregations of employment and wage concentrations within certain geography. The formation of clusters assumes that some elements of the economic outcomes will stay local while a majority of the goods and services are exported. Advanced Manufacturing tends to serve the needs of national and global markets – and as such sees increased value from accessing new markets in China, Europe and South America. Therefore, a thriving and competitive cluster is marked by the increasing and sustainable market-share derived from exporting beyond the local geography.

This is one factor for re-examining Nevada’s approach to economic development: we want to know what percentage of national and global market-share should be captured in Nevada’s clusters as a result of a healthy, competitive business climate.

What has caused this shift in our assessment approach? After conducting a national program for the U.S. Department of Labor’s Employment and Training Administration in forty unique regional pilots, we have *identified transitions in corporate operating models and the internal workings of human capital management. We believe that the era of regional clusters of industry as the only model of proving regional competitive advantage is now over and that it is vital for national, state, and regional leaders to embrace strategies that respond to clusters of knowledge and competency.*



Over the past five years, predicated on assessments begun through the Department of Labor pilots, we confirmed the following:

“Central to much thinking about how organizations should be restructured for the 21st century is the idea that innovation and growth will depend more and more on so-called knowledge workers, the sort of people who, to quote the title of a recent book...find themselves ‘Thinking for a Living’..”

The Economist, 2006

This concept of ‘thinking for a living’ is supported by both anecdotal findings from the field and a number of new reports and briefing materials captured by top business management firms and human resource agencies:

“...in some industries, such as financial services, media, and pharmaceuticals, they (McKinsey) think the share may already be as high as 25% (of the corporate labor force)...”

The Economist, 2006

Aligned with this shift in recognizing a new form of human capital, corporations and emerging enterprises are framing their competitive structures along networked, distributed models rather than the 19th-20th century fully integrated models. In the U.S., large pharmaceutical companies outsource nearly 65% of their operations, and the defense industry outsources in excess of 70% of their operations. Outsourcing as a business model is now permanent - research, testing and evaluation, and production-manufacturing have long been under pressure to adopt the ‘proximity to the best minds’ approach by locating next to universities, Federal laboratories and places where a certain baseline of demand helps shape product development. It has only been the recent political and media debate about the offshoring of work to international locations that has confused the long-standing evolution of the distributed, networked model.

As recent as mid-2010, site selector and location advisors were acknowledging a new trend of retrenchment of U.S. firms from China back to states and communities throughout America. Value in low-cost labor, production, energy, and other factors - while beneficial to corporate margins – could not be guaranteed against intellectual property loss, nor the significant capabilities of U.S. engineering, manufacturing and production practices. Simply, if Nevada is to attract a new generation of outsourcing and expansion opportunities, it must examine its role in creating knowledge-workers and those that support knowledge-based industries.

Money, Fortune, Forbes, and BusinessWeek magazines have all begun to capture the emergence of these new responses to globalization, human capital and reorganization of structures to fit the future. It is telling that even in a post-recession economy, many of these popular media entities have run series that link the best places for work with the future of job characteristics and knowledge. Even the Bureau of Labor Statistics and the Census Bureau are recognizing new

occupations that did not exist three years ago (a sample found in the chart above) have become the fastest and highest paying positions in the U.S. – disease mapper, gene therapist, information engineers. These are occupations that combine several skills and competencies – sometimes within one

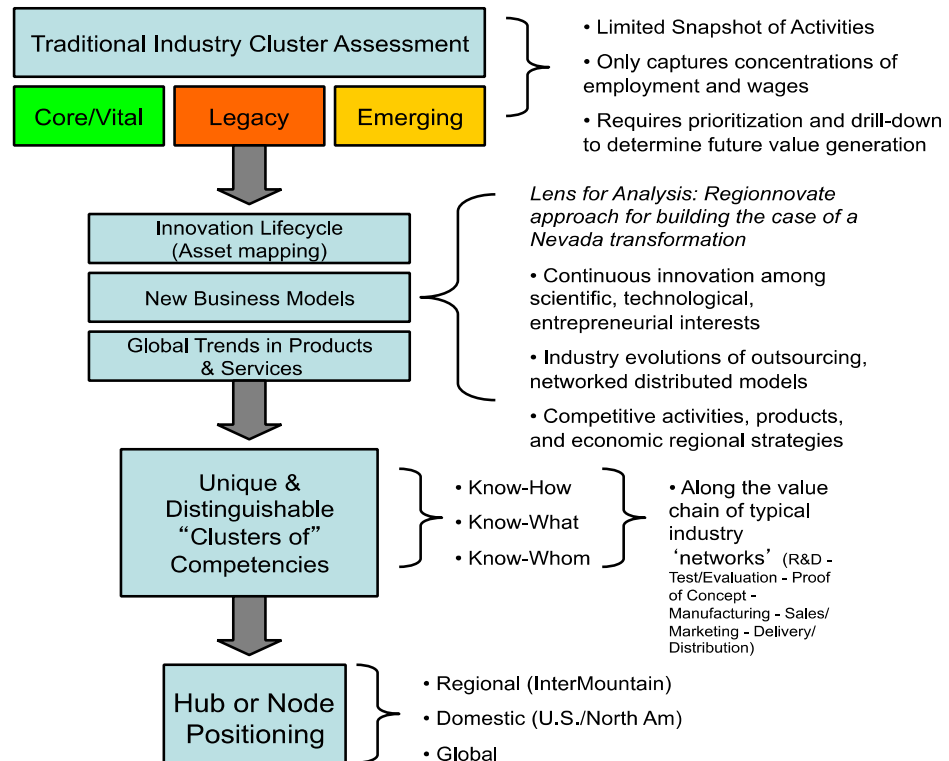
New Careers and Hot Jobs in the 21st Century			
New Careers	Average Salary	Education	Technology
Radio Surgeon	\$200-800K/year	Doctorate	Cyberknife
Info Engineer	\$ 70-120K/year	Associate	Data mining/ analytics
Robot Programmer	\$ 40-100K/year	Associate/4yr	Simulation tools
Disease Mapper	\$ 40-150K/year	PhD	Digital imaging



person, mainly among a team of knowledge-expertise from various fields and disciplines ... and not all requiring a Ph.D. or post baccalaureate degree.

Figure 23 below details the high-level process by which we have assessed Nevada’s current and emerging strengths - and have identified opportunities for innovation, commercialization and renewed economic prosperity. Rather than focusing on employment and wage figures, the Assessment Model drills into the data around occupations, competencies and industry trends.

Figure 23: Cluster of Knowledge Assessment Model



Over the past decade, elected officials and corporate leaders across the country recognized that a competitive economy requires a competitive workforce and unique competencies above all other ‘assets’ or incentives:

- “An educated, well-trained workforce is the key to our state's economic prosperity. We need to take down the no vacancy sign and ensure we are focusing on the needs of both today and tomorrow's employers.” – Former Gov. Christine Gregoire, State of Washington
- “If we're going to create the best business climate to create higher paying jobs and retain our young people, we're going to have to build a workforce prepared for the opportunities of the future.” – Former Gov. and now U.S. Senator John Hoeven, State of North Dakota
- “The best economic-development tool is a well-educated workforce.” – Former Gov. Bill Ritter, State of Colorado
- “Keep your tax incentives and highway interchanges... We will go where the highly skilled people are.” – Carly Fiorina, Former CEO, HP

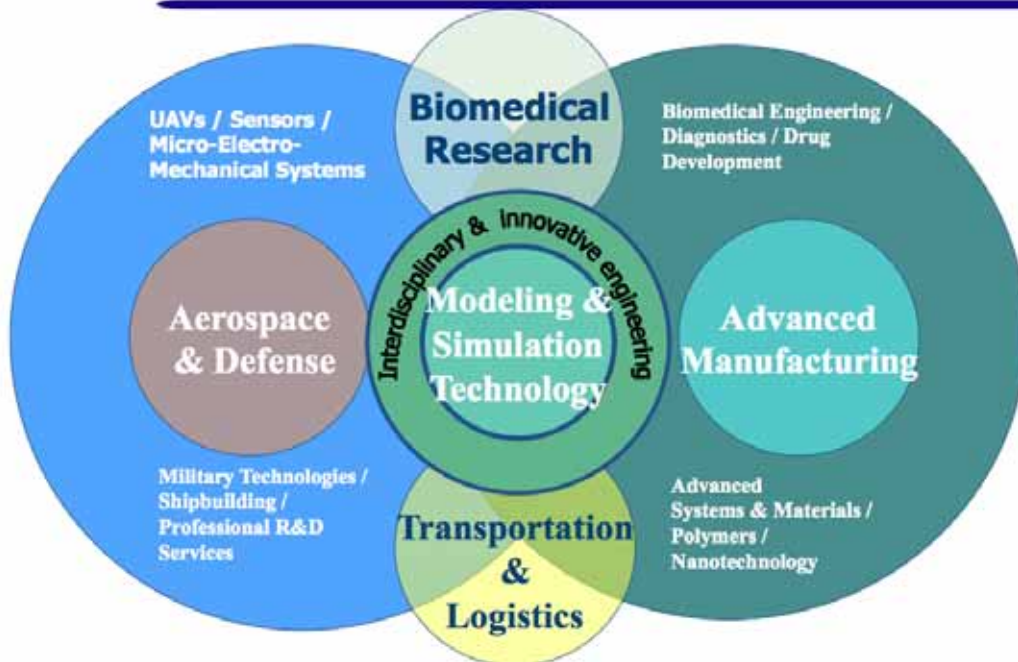
As an example, the State of Alabama determined that its core economic ‘competency’ (know-how) was Modeling and Simulation Technologies, impacting four traditional clusters of activity across private and public sector



investments. From its roots in the very early days of the space-race against Russia to the latest initiatives in the defense industry, Alabama accumulated not clusters of industry but an extremely powerful knowledge-base that has shifted its reliance upon government grants to global contracts. By acknowledging its core competencies, states and regions build their global 'brand' to attract and recruit individuals and industries.

Figure 24: State of Alabama: The Knowledge Economy—Clusters of Competency

The Knowledge Economy – Clusters of Competency



If Nevada is to be a location for future expansion or even consolidation of industry investment, there must be a sense of understanding and promoting its core competencies – the unique Nevadan competitive advantage. Through such an approach, Nevada could reshape its economic competitiveness by linking internal corporate market intelligence, long-range planning, and needs for labor and infrastructure with these trends and forecasts.

Competitor states and nations have not picked 'winners and losers,' but have determined where the best returns on investment will result from targeted resource allocation by linking competencies, knowledge of markets, and product and service development to a stable business climate. **Our guidance based on best practices in the U.S. is to seek greater alliance between skills, competencies, and talent development with growth industries, sectors, legacy clusters, and global competitiveness.**

The implications for Nevada's future economic development delivery are:

- Greater coordination between the State's workforce, higher education, economic development and transportation/infrastructure public sector leadership, management and strategic planning efforts in an executive branch-driven office similar to a 'Nevada Jobs Cabinet'
- Interactions between business and academic human resource demands and the supply-chains for certifications, degrees, skills upgrade and similar progress in a workforce continuum of activities and investments
- Increased focus on recruitment and retention of students, faculty, researchers, technical talent and a diverse workforce that is benchmarked against global standards of competency



- Formation of networks across the State’s regional assets, institutions and business/industry interests to monitor on-going resource requirements and investments based on knowledge accumulation - and then where knowledge can be applied towards new markets and opportunities from scientific, technological, engineering and manufacturing expertise.
- Intermediaries that serve as bridge-builders, connectors, or so-called “mavens” from Malcolm Gladwell’s *Tipping Point* research - individuals and organizations that are responsible for creating consortium and unique partnerships for product development and market-making efforts

If Nevada is to both grow its way out of the current fiscal crises and create a sustainable economic engine, the recruitment and attraction of occupations to the State with the highest incomes provides for a reinvestment strategy in the innovation and commercialization of ideas and products through increased taxes, corporate and philanthropic resources, and personal investment scenarios. Management occupations with wage rates above \$100,000 versus Food Preparation and Serving-related occupations below \$20,000 – the equation is not rocket science. Of note is that there are more individuals spread throughout the State with occupations in high-wage positions – among the private sector, Federal programs and initiatives, and the non-profit research community. The dichotomy of the Nevada economy becomes clearer when examined through occupations, wages, and level of positions found as a part of the innovation-based sectors.

In review, updating the current economic landscape for sector related activities along with understanding which sectors had survived during the Great Recession, we have been able to identify that those sectors with wages most likely to transform the Nevadan economy are those reliant upon science, technology, engineering, applied and translational research, and commercialization towards market demand.

Figure 25: Nevada Employment by Classification



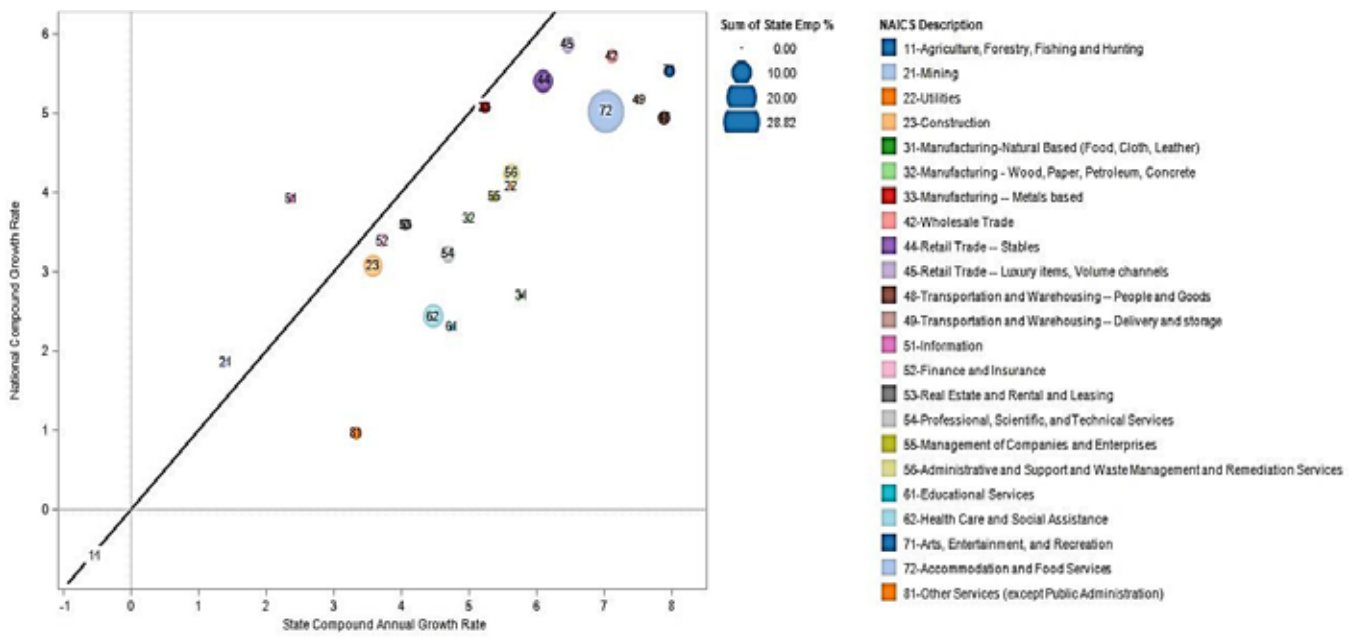


Table 5: Occupations Critical to Innovation

The key occupations that will drive the Nevadan innovation and commercialization capacity include:

- | | |
|--|---|
| 21 Mining | 51 Information |
| 22 Utilities | 52 Finance |
| 33 Manufacturing – Metals based | 54 Professional, Scientific, and Technical Services |
| 48 Transportation and Warehousing – People and Goods | 55 Management of Companies and Enterprises |
| 49 Transportation and Warehouse – Delivery and Storage | 61 Educational Services |
| | 62 Health Care and Social Assistance |
| | 71 Arts, Entertainment and Recreation |

Figure 26: Growth Rate of Occupations in Nevada



The compounded growth rates for key Nevada sectors continues to indicate that diversification in the upper tier remains ‘consumer oriented’, though manufacturing of metals, management of companies and enterprises, health care, waste management and remediation services show strength in the next five years. Assuming no other invention by State investment, increased global competition and unknown technological surprises, Nevada must be purposeful about targeting sub-sectors for recruitment and attraction of supply chains around sectors with long-term value. Further, the State must differentiate the supply chain based on how Nevada assets assist them through consistent innovation and commercialization.



Table 6: Employment by Occupation in 2009

Employment by Occupation Current Year	
	Trade Area built from components
Total by Occupation Current Year	1,107,395
Occupation Managerial executive Current Year	143,112
Occupation Professional specialty Current Year	162,917
Occupation Healthcare support Current Year	12,254
Occupation Protective Current Year	31,594
Occupation Food Preparation Serving Current Year	84,463
Occupation Building Maintenance & Cleaning Current Year	44,504
Occupation Personal Care Current Year	77,590
Occupation Sales Current Year	137,688
Occupation Office Admin Current Year	174,404
Occupation Farming, Fishing, & Forestry Current Year	2,624
Occupation Construction Current Year	124,422
Occupation Production Transportation Current Year	111,823

If one is to create these innovation ‘teams’ a strategy must be put in place to examine skills, degrees, and certifications as the underlying value for serving growth-oriented targets of opportunity.

Figure 27: Concentration of Employment in Media Production and Entertainment

By examining certain occupational strengths – including those that serve the needs of starting and growing new firms and emerging enterprises – one finds that Nevada does have a concentration of expertise for instance in areas related to industrial design, production, engineered entertainment. For instance, “*Entertainment Engineering*” magazine references Nevada’s strengths in creating the ‘next generation’ of staging and performance for some of the most expensive sets in the world.

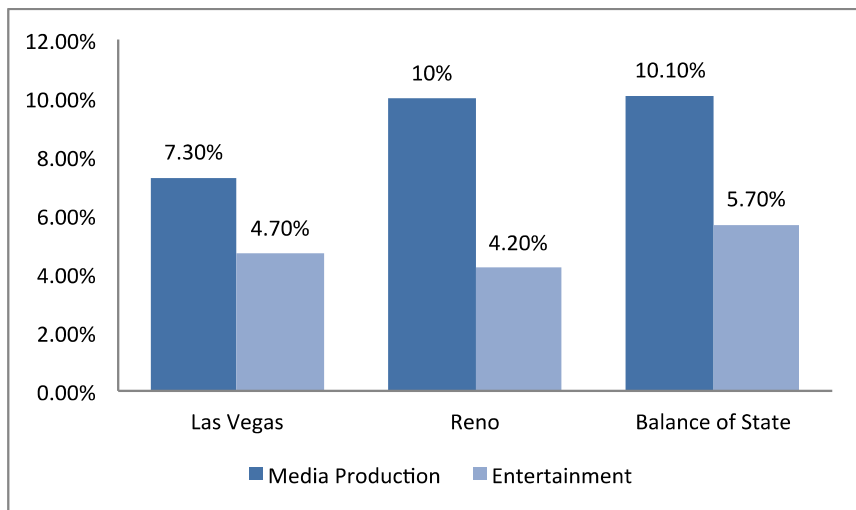
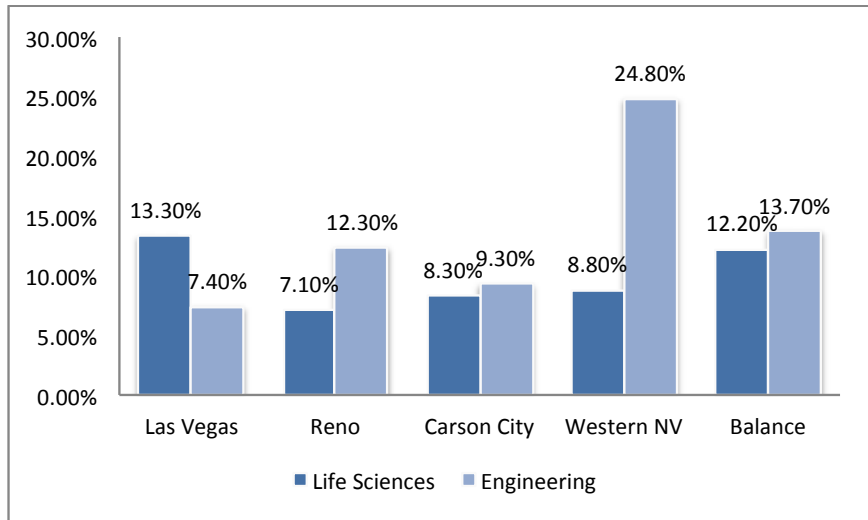




Figure 29: Concentration of Employment in Life Sciences and Engineering

In fields of interest for the life sciences and engineering related to medical devices, components, health information and computational engineering – though just evolving – the underpinnings for shifting employees with specific expertise to these new opportunities requires certification and cross-training. Yet, again the employment base exists for advancing commercialization by identifying those individuals with specific talents and skills – team by team.



Therefore, to accelerate a Nevada commercialization strategy, the State economic and workforce entities along with the private sector must adopt the means for identifying a “community of innovators” through a capture of expertise, levels of knowledge, and willingness to engage in entrepreneurial and innovative behavior. The approach to building teams of expertise around the Targets of Opportunity is encouraging as the employment base does exist but has not been organized accordingly; the challenge will be to formulate a Nevada Innovation Team Employment Strategy that leverages those already in the State and those that must be recruited while the education system produces a long-term pipeline.



Appendix C: Federal Funding

To support the assessment of commercialization potential, we collected available grant and contract funding from all Federal departments and agencies to an entire range of recipients – public and private higher education, industry and other private sector, non-profit research organizations, individuals. Table 7 below outlines top agency funding to Nevada in areas of scientific, technological, engineering, and infrastructure support that align with unique scenarios. Not included but available for additional review and analysis are data-sets on funding for education, training, and certification-related programs that support the innovation-capacity building of Nevada’s commercialization outcomes, as well as grants for infrastructure, equipment, and facilities on academic campuses and (where publicly disclosed) military and related locations.

Table 7: Top Federal Grant and Contract Funding Programs in Nevada

Department	Sub-Agency/Program	Total Years Amounts
Department of Energy	Renewable Energy R&D	\$111,862,116
	Science Financial Assistance	\$ 83,630,016
	S&T For Environmental Mgt.	\$ 41,881,652
	Defense Non-Proliferation Programs	\$ 40,225,807
	State Energy Programs	\$ 23,996,183
	Nuclear Energy Research Initiative	\$ 22,492,262
	Energy Efficiency Block Grants	\$ 17,094,724
	Advanced Nuclear Medicine Initiative	\$ 15,844,678
	Nuclear Waste Disposal Siting Program	\$ 3,791,956
Fossil Energy R&D	\$ 3,375,565	
Department of Defense	Army Medical R&D Programs	\$ 31,990,268
	Army Research Laboratory Command	\$ 31,439,977
	Air Force R&D Programs	\$ 7,655,408
	Basic and Applied Research Programs	\$ 4,188,958
	Defense Advanced R&D (DARPA)	\$ 2,836,500
	Army Research and Tech Development	\$ 315,693
Department of Commerce	Economic Development Administration	\$ 32,174,422
	National Institutes of Standards and Technology (NIST) Manufacturing Extension Program	\$ 18,981,557
	National Oceanic and Atmospheric Admin	\$ 18,877,389
	NIST Advanced Technology Programs	\$ 7,939,614
	NIST Measurement & Engineering Directorate Programs	\$ 388,653
National Science Foundation	Math and Physical Science Programs	\$ 96,974,489
	Education and Human Research Program	\$ 66,388,347
	Biological Science Programs	\$ 33,322,058
	Engineering Programs	\$ 28,973,689
	Geological Science Programs	\$ 21,172,628
	Cyber Infrastructure Program	\$ 11,117,656
	Polar Science Program	\$ 10,600,056
	Computer and Info Science Engineering	\$ 6,472,121
Department of Agriculture	Special Research Grants Program	\$ 13,740,919
	Small Business Innovation Research	\$ 1,491,366
	Research Program Office	\$ 862,136
	Bioenergy Research Program Office	\$ 532,711
Department of Interior	Earthquake Hazards Reduction Program	\$ 4,182,374
	Water Resource Research Program	\$ 3,886,105

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Table 7: Top Federal Grant and Contract Funding Programs in Nevada (continued)

Environmental Protection Agency	Clean and Drinking Water Revolving Fund	\$ 65,342,000
	Air Pollution Control Program Support	\$ 24,767,958
	Clean Air Act, Other Surveys and Studies	\$ 7,801,841
	State Clean Diesel Grant	\$ 2,448,612
Department of Homeland Security	Non-reportable for 2008-2010	
Department of Health and Human Services – National Institutes of Health	Research Infrastructure Support	\$103,067,323
	Digestive Diseases and Nutrition Research	\$ 38,051,067
	Heart and Vascular Disease Research	\$ 37,456,886
	Blood Diseases and Resources Research	\$ 18,772,804
	Lung Diseases Research	\$ 17,261,844
	National Bioterrorism Hospital Preparedness and Research Support	\$ 16,346,968
	Microbiology and Infectious Diseases	\$ 15,410,348
	Diabetes, Endocrinology, and Metabolism Research	\$ 14,154,202
	Cancer Biology Research	\$ 13,170,983
	Allergy, Immunology, and Transplantation	\$ 12,842,400
	Arthritis, Musculoskeletal, and Skin Disease	\$ 8,668,321
	Extramural Programs in Neurosciences & Neurological Diseases	\$ 3,501,499
	Cancer Cause and Prevention Research	\$ 3,436,478
	Aging Research	\$ 3,244,777
	Alzheimer's Disease Demonstration Grant	\$ 1,710,857
	Biomedical Technology Research Program	\$ 596,056
Biological Bases for Neuroscience R&D	\$ 287,962	
NASA	Research Grants for the Space Program	\$ 5,627,942
Department of Transportation, Federal Highways, Federal Transit	Transportation Research Programs to the States	\$ 13,875,867

(Above amounts are for the Fiscal Years 2000 to 2009 plus Q1 – 2010)

Though previous reports have examined Federally-funded research in Nevada, our intent is to not rank where the State is or is not in comparison to others; rather, the focus is to identify the 'gems' of basic, applied, clinical and translational research that could be immediately commercialized through partnerships, investments, and network on a national and global level.

What is important to note about Federal funding of grants and contracts is that, if not for the National Institutes of Health, many states like Nevada would note that a majority of funding goes to the private sector and non-profit entities. Simply, defense, homeland security, and to some degree energy funded programs are contracted for the creation of new weapons systems, operational technologies in the field, and long-term product development.

Based on work with the RAND Corporation, the National Science Foundation, and previous leadership in the White House Office of Science and Technology, Regionnovate has found that approximately 40% of a contract for defense or homeland security involves applied or translational research in near-to-market technologies. Therefore, all the more reason why this analysis has concluded that opportunities exist over the next 12-18 months for increased collaboration and commercialization with non-academic research entities, though there are emerging technologies in the NSHE environment ripe for investment on the horizon.



Appendix D: Measurement Challenges

A robust discussion and debate has been held among Nevada's economic and workforce communities. In examining regional vision exercises, as well as over 30+ different rankings of Nevada by external sources, consensus has been to observe these rankings, understand the methodology and analysis behind each ranking, and then to determine how Nevadans seek to measure themselves and on which key elements. Simply, we advise that Nevadans must decide their own fate based on their measures of success, performance, and outcomes – not those imposed externally.

Rankings provide an insight to how others perceive Nevada and its economy - and in observing these annual reports, magazine articles, and briefing materials on "competitiveness," "Innovation," and/or economic growth – we find value in recognizing that external validation or even warning about the current directions of Nevada should be a part of the consideration for action taken by end-users.

However, a number of the rankings cause confusion when competing measures suggest that Nevada is 'great, good, or bad' across the same themes. For instance, a number of rankings suggest that Nevada is either a hospitable state or a very negative location for 'Doing Business.' After delving into the data and information used to form these rankings, we determined that it was best to identify metrics and indicators that – when standing alone – could provide insight as to the necessary direction of the 'needle' on Nevada's current and future competitiveness.

Several economic and innovation-focused organizations of Nevada's peers have directly or indirectly driven performance measurement at the state and regional economies for their members and partners. For example, one of the most extensive initiatives is in Oregon: "The Oregon Progress Board is an independent board created by the Legislature in 1990 to monitor the state's 20-year strategic vision, *Oregon Shines*, and keep it current. The 12 member panel, chaired by the Governor and made up of citizen leaders, reflects the state's social, ethnic and political diversity." The Progress Board, recently defunded due to severe fiscal challenges in the State, has spawned several organizational partnerships to maintain the performance metrics system through the public sector as well as to engage in citizen-supported indicator reports and forums. Further, Oregon has continued to use a robust online dashboard (found at <http://benchmarks.oregon.gov/>) to engage the broadest interest for its economic and governance strategies. The long-term impact for Oregon and its regions has been cluster-focused economic developments supported by a constantly monitoring of the health of the State's people, infrastructure, and business environment.

Similarly, the Michigan Turnaround Plan was driven by the business community seeking to prevent the State's fiscal and employment challenges causing further damage to the long-term prospects of company growth and retention. An exhaustive assessment of the business-case issues facing the private sector was coupled with a number of metrics on the top critical factors negatively impacting employment as well as benchmarks against competitor states with similar profiles in manufacturing, operations, and innovation capacities. The Turnaround Plan is considered the pivotal document used during the 2010 election cycle, and has been broadly distributed to legislators, local elected officials, economic organizations and chambers of commerce. The Plan's metrics are driving fiscal policy-making, job creation, and highly targeted allocations.

Because indicators, metrics, and performance do not occur in a vacuum, Nevada must include the results of the short-term funding of programs through the Federal Recovery Act, national security or terrorists threats, and disruptive technologies and services that shift competitiveness on a daily basis through innovating traditional delivery. Therefore, in using the Index, these uncertainties should provide perspective that these are mileposts for consideration rather than hard-and-fast 'rules' that cannot be adjusted over time.

One final perspective on a draft competitiveness index focuses on the types of actions that are being measured. The tougher measurements are often those that seek to impact mindset, culture, transformation, and response to change. We know that measuring academic performance and related test results is a clear demonstration of progress in STEM instruction, however parental involvement in supporting graduation from high school, community college, or a four year university are vital to the prospects for addressing this challenge in Nevada.



We know that measuring the number of researchers, investigators, and scientists within state academic institutions and industry describes employment patterns for potential high wage sectors and employment patterns in technology-related industries, and yet measuring the willingness and related incentives to commercialize, invent, innovate and otherwise be more market-oriented during times of fiscal decline is not an easy proposition. Simply, a competitiveness index can 'keep score' in certain ways but also requires measuring so-called soft-skills that are just as if not more important to achieving the objectives of 'SILVER' Spark. These alternative metrics focused on "connectivity, networking and social capital" require further discussion to ensure implementation of recommendations are sustainable well into the future based on accountability and purposeful decisions to change mindsets and performance results.



Appendix E: Vital Asset Map

Facilities, Infrastructure, Initiatives and Programs Supporting Innovation and Commercialization

TARGET OF OPPORTUNITY	ASSET	POTENTIAL OPPORTUNITY, USE AND/OR ROLE
<p>Simulation, Modeling and Imaging</p>	<ul style="list-style-type: none"> • Earthquake Simulation Laboratory – UNR • Nevada Seismological Laboratory – UNR • Cyber Conflict Research Consortium Agent Modeling Lab- UNR • Computer Networking Lab – UNR • Computer Vision Lab- UNR • Evolutionary Computing Systems Lab for Military and Gaming – UNR • Goodman Brain Computation Lab – UNR • Neuroevolution & Behavior Lab – UNR • High Performance Computation & Visualization Lab – UNR • Center for Cyber Security Research – UNLV • Identify Theft & Financial Fraud Research and Operations Center – UNLV • Nevada Center for Advanced Computational Methods – UNLV • Center for Information & Communication Technology – UNLV • International Gaming Institute – UNLV • Center for Gaming Research – UNLV • Atmospheric & Dispersion Modeling Lab – DRI • CEFA Operations and Forecast Facility – DRI • Center for Advanced Visualization, Computation, and Modeling – DRI • Mesoscale Dynamics and Modeling Lab – DRI • Lou Ruvo Brain Institute • Nellis Air Force Base Warfare Center • Nellis Air Force Base Marine Corp Warfighting Laboratory • Nellis Range Complex Integrated Threat Simulator Lab • InSAR Lab – UNR & NASA • Department of Computing and Information Technology - CSN 	<p>Each of these assets represents an emerging or existing capability in simulation, modeling and imaging applied towards military, industrial, energy, environment, health and disease and homeland security scenarios.</p> <p>By combining the talents, skills, know-how of expertise, facilities, equipment and operations - Nevada has a critical network and capacity to apply simulation, modeling and imaging to regional and national interests for collaboration on targeted products and technologies.</p> <p>Formation of a statewide network and knowledge cluster - including the underlying intellectual capital already in the pipeline (patents, early-stage product development) could attract corporate partnerships and investment in Nevada’s highly regarded military and academic centers of excellence.</p> <p>Similar to other locations with a significant military presence, high tech information services and demand and unique utilization of modeling capabilities, identifying the underlying transferable skills and knowledge is critical to exploiting these assets in new discoveries and development.</p>



TARGET OF OPPORTUNITY	ASSET	POTENTIAL OPPORTUNITY, USE AND/OR ROLE
<p>High Performance Computational Analysis</p>	<ul style="list-style-type: none"> • Electron Microscopy & Micro-Analysis Facility – UNR • Nuclear Materials Operational Safety Lab- UNR • Active Materials Processing Lab – UNR • Pavements & Materials Research Lab- UNR • Center for Energy Materials Interaction Technology Initiative of Nevada – UNLV • Nevada Manufacturing Research Center – UNLV • Center for Health Information Analysis – UNLV • Aerosol Physics & Research Lab – DRI • Storm Peak Lab (Atmospheric and High Terrain) – DRI • Center for Environmental Remediation and Monitoring – DRI • Organic Analytics Lab – DRI • Particulate Emissions Measurement Lab – DRI • National Nuclear Security Administration Nevada Site – US Department of Energy • Nellis Air Force Base - Joint Unmanned Aircraft System Center of Excellence 	<p>Though complementary to Simulation, Modeling and Imaging, High Performance Computational Analysis leverages assets that are more traditionally focused as “in the field” - or more direct hands-on experiences whereby technical expertise is applied for product quality control and quality assurance.</p> <p>Because of unique environmental conditions - especially high altitude and harsh desert settings – in-field testing can be completed within one geography. Further, unique testing and evaluation of impacts in remote locations removed from large populations allows for immediate opportunities in partnership with communities and oversight, regulatory bodies that are responsive to industry needs based on previous experiences and understanding.</p> <p>High Performance Computational Analysis can save a product development cycle millions if not billions of dollars in lost revenues by applying robust systems and vigor to the business process by leveraging technical know-how to areas that are similar, dual-use scenarios, opportunities - e.g. unmanned aircraft, environmental air or water pollution, modeling software and testing of sensors, filters and emissions control - all combined create for unique testing capabilities.</p>



TARGET OF OPPORTUNITY	ASSET	POTENTIAL OPPORTUNITY, USE AND/OR ROLE
<p>Energy Assessment, Generation and Operations</p>	<ul style="list-style-type: none"> • Statewide Climate Change Initiative • Nevada Terawatt Facility - UNR • Bioresource Renewable Energy Lab – UNR • Electrical Power & Renewable Energy Systems Research Lab – UNR • Natural Energies Advanced Technologies Lab – UNLV • National Supercomputing Center for Energy and the Environment – UNLV • Cloud Microphysics & Aerosol Chemistry Lab- DRI • Curation Facility – DRI • Gallagher Great Basin Environmental Research Lab – DRI • Western Regional Climate Center – DRI • Clean Tech & Renewable Energy Lab – DRI • Center for Watersheds & Environmental Sustainability – DRI • Great Basin Center for Geothermal Energy – DRI • National Geothermal Institute - UNR • Nevada Southwest Energy Partnership – DRI • Renewable Energy Center – UNLV • UNR REC – Solar Power Generation, Hydrogen Power Systems, Thermal Compression of Hydrogen, Zero Energy Home Pilot Project • Tahoe Science Consortium • Green New Jobs for Nevada Workforce Program • Nellis Air Force Base Photovoltaic Array • Center for Environmental Sciences – Sierra Nevada College • Smart Grid Assessment Program – NV Energy, UNLV-UNR 	<p>From its geothermal to solar energy production, from renewable biosources to nuclear materials, Nevada is poised to be a leader in the assessment and operations of new facilities, generation, production, load factor into the grid and overall environmental impact all in one state and several important settings.</p> <p>As energy is both a national and economic security issue for the Nation, the underlying programs, research and intellectual capital based within these assets provides for a highly collaborative focus on real-time product and service development for export.</p>



TARGET OF OPPORTUNITY	ASSET	POTENTIAL OPPORTUNITY, USE AND/OR ROLE
<p>Mining and Minerals</p>	<ul style="list-style-type: none"> • W.M. Keck Earth Sciences & Mining Research Center – UNR • McKay School of Earth Sciences & Engineering – UNR • Nevada Mining Association • Geological Society of Nevada • Nevada Bureau of Mines and Geology – Analytical Lab, Nevada Geodetic Lab • Archeobotany and Archeology Lab – DRI McCaw School of Mines and Museum 	<p>One of the longest and sustainable economic pillars of Nevada, mining and minerals continues to generate global expertise, resource management, attraction of innovative companies and technologies and embedded corporate, industry know-how in practice and application.</p>
<p>Targeted Mechanical & Electrical Engineering</p>	<ul style="list-style-type: none"> • Engineering Access Grid Node - UNR • Robotics Research Lab – UNR • Software Engineering Lab – UNR • Earthquake Engineering Simulation Lab- UNR • Mechanical Behavior Lab – UNR • Biomechanics Lab – UNR • Electric Drives Lab – UNR • Antenna Chamber Lab – UNR • Biomechanics Lab – UNLV • High Pressure Science & Engineering Center – UNLV • Carter Family Optics and Acoustics Lab – DRI • Department of Applied Technologies – CSN • Electrical and Industrial Technology Center – Great Basin 	<p>Engineering - especially mechanical and electrical - remain the critical 'connector' for the future of manufacturing, testing and evaluation and applied technologies across several disciplines and sectors. Without a strong engineering competency program, Nevada could not exploit the opportunities outlined throughout this report.</p> <p>Though research is underway at the NSHE institutions, the vital application is occurring in the employment of and innovative by the private sector throughout the State as well as the retained positions within the military. However, its most unique opportunity is to strengthen "entertainment engineering" for global export.</p>



TARGET OF OPPORTUNITY	ASSET	POTENTIAL OPPORTUNITY, USE AND/OR ROLE
<p>Support for Innovation, and Commercialization Capacity Building</p>	<ul style="list-style-type: none"> • Sierra Nevada College • Nevada’s Center for Entrepreneurship and Technology • Nevada Regional Science Bowl (NSO-US Dept. of Energy) • LIED Discovery Children’s Museum • Southern Nevada Medical Industry Coalition • Area Health Education Center of Southern Nevada • Las Vegas Academy of International Studies in Performing and Visual Arts • Advanced Technologies Academy • Academy of Mathematics, Science and Technology @ Bridge Middle School • The Davidson Academy of Nevada - UNR • Nellis Air Force Base Family Medicine Residency • UNR School of Medicine • Entrepreneurship Nevada • Nevada Small Business Development Center – UNR • Rural Nevada Development Corporation – USDA • Entrepreneurial Mentors Corp – NIREC/SBA • Center for Economic Development - UNR • Extension Services – UNR/USDA • IGT Applied Technology Center – Truckee Meadows CC • Nevada Microenterprise Initiative • C4Cube Incubator • Technology Business Alliance of Nevada • Reno Angels • Sierra Angels • Vegas Valley Angels • Northstar Ventures • Nevada Alliance for Defense, Energy and Business <p>Nevada Institute for Renewable Energy Commercialization</p>	<p>A number of programs, institutions, networks and even education initiatives at the middle-high school and college levels are spread throughout the State. Though the most recognized of these efforts in support of innovation and commercialization can be found in a handful of organizations, the opportunity built upon teaching, learning and encouraging a new generation of Nevadans can be found in museums and after-school settings.</p>



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About NIREC



The Nevada Institute for Renewable Energy Commercialization (NIREC) is a 501(c)3 independent

nonprofit organization integrating researchers, experienced entrepreneurs, business executives and financial capital to identify, fund and accelerate the development and deployment of clean energy solutions.

With a focus on renewable energy, energy conservation and energy efficiency technologies, NIREC works with its research partners and early-stage companies nationwide to drive innovation, commercialization and technology-based economic development. www.nirec.org

About Regionnovate, LLC



Richard Seline has been in the forefront of

analysis, debate and implementation of strategies to address opportunity gaps and leverage strengths around strategic partnerships amongst academic, business, civic, government, industry, and

philanthropic entities as a consultant focused on innovation, commercialization and technology-driven economic development.

The spark of Richard's experiential learning was his service as Special Assistant to the President of the University of Texas' M.D. Andersen Cancer Center in the Texas Medical Center. In this role he bridged policy-making, research, commercialization and economic outreach at the state and Federal levels on behalf of the \$500 million academic clinical research and patient institution.

Through over 100 ensuing engagements at global, national, regional and state levels, Richard has examined, benchmarked, and facilitated a number of forums, explorations and dialogues on the emergence of innovation in the public and private sectors, leading to new methodologies and implementation tactics. Richard has shifted the traditional thinking from "Clusters of Industry" over time to focus instead on clusters of knowledge, competency and skills - thereby transforming models of linking know-what, know-how, and know-whom.

Richard formed Regionnovate to focus on repurposing, rebuilding and reinventing assets for increased innovation capacity, commercialization and economic success. More on Richard and Regionnovate can be found at www.regionnovate.com.