THE UNIVERSITY OF WYOMING

BOARD OF TRUSTEES' REPORT

Wednesday, December 12, 2018

The final report can be found on the University of Wyoming Board of Trustees Website at
http://www.uwyo.edu/trustees/

University of Wyoming Mission Statement (July 2017)

We honor our heritage as the state's flagship and land-grant university by providing accessible and affordable higher education of the highest quality; rigorous scholarship; the communication and application of knowledge; economic and community development; and responsible stewardship of our cultural, historical and natural resources.

In the exercise of our primary mission to promote learning, we seek to provide academic and co-curricular opportunities that will:

- Graduate students who have experienced the frontiers of scholarship and creative activity and who are prepared for the complexities of an interdependent world;
- Cultivate a community of learning energized by collaborative work among students, faculty, staff and external partners.
- Nurture an environment that values and manifests diversity, internationalization, free expression, academic freedom, personal integrity and mutual respect; and
- Promote opportunities for personal health and growth, physical health, athletic competition and leadership development for all members of the university community.

As Wyoming's only public university, we are committed to scholarship, outreach and service that extend our human talent and technological capacity to serve the people in our communities, our state, the nation and the world.

TRUSTEES OF THE UNIVERSITY OF WYOMING AGENDA
Wednesday, December 12, 2018
Conference Call Meeting; Old Main Boardroom

<u>WORK SESSIONS</u>

AGENDA ITEM TITLE:
Consideration and Action: November 14-16, 2018, Board of Trustees Meeting Minutes (public session & executive session), True

SESSION TYPE:
☐ Work Session
☐ Education Session
☐ Information Item
☐ Other:
[Committee of the Whole – Items for Approval]

APPLIES TO STRATEGIC PLAN:
☐ Yes (select below):
    ☐ Driving Excellence
    ☐ Inspiring Students
    ☐ Impacting Communities
    ☐ High-Performing University
☐ No [Regular Business]

☐ *Attachments are provided with the narrative—refer to Supplemental Materials Report.*

EXECUTIVE SUMMARY:
The draft minutes were uploaded to the Trustee secure website for review and comment in advance of the meeting.

AGENDA ITEM TITLE:
Consideration and Action: Approval of contracts, agreements, and procurements, Whaley

SESSION TYPE:
☐ Work Session
☐ Education Session
☐ Information Item
☒ Other:
[Committee of the Whole – Items for Approval]

APPLIES TO STRATEGIC PLAN:
☒ Yes (select below):
    ☒ Driving Excellence
    ☒ Inspiring Students
    ☐ Impacting Communities
    ☐ High-Performing University
☐ No [Regular Business]

☒ *Attachments are provided with the narrative—refer to Supplemental Materials Report.*

EXECUTIVE SUMMARY:
UW Regulation 7-2 (Signature Authority) requires Board approval for University contracts, federal contracts, agreements, memorandums of understanding, and procurements that involve an external party, require consideration (paid or received) valued more than $1,000,000 (one-time or in aggregate), or for which the term is more than five years.

A list of contracts, agreements, and procurements that the University is seeking approval to execute will be provided.

PRIOR RELATED BOARD DISCUSSIONS/ACTIONS:
Standing item at each Board meeting, as needed.

WHY THIS ITEM IS BEFORE THE BOARD:
UW Regulation 7-2 (Signature Authority) requires Board approval for University contracts, federal contracts, agreements, memorandums of understanding, and procurements that involve an external party, require consideration (paid or received) valued more than $1,000,000 (one-time or in aggregate), or for which the term is more than five years.

ACTION REQUIRED AT THIS BOARD MEETING:
Board approval or disapproval for Administration to execute the contracts, agreements, and procurements as provided to the Board.

PROPOSED MOTION:
"I move to approve Administration to execute the list of contracts, agreements, and procurements as provided to the Board."

PRESIDENT'S RECOMMENDATION:
The President recommends approval.

AGENDA ITEM TITLE:
Consideration and Action: CMAR for Science Initiative, McKinley/Theobald/Kibbon

SESSION TYPE:
☐ Work Session
☐ Education Session
☐ Information Item
☒ Other:
[Committee of the Whole – Items for Approval]

APPLIES TO STRATEGIC PLAN:
☐ Yes (select below):
    ☐ Driving Excellence
    ☒ Inspiring Students
    ☐ Impacting Communities
    ☐ High-Performing University
☒ No [Regular Business]

☐ *Attachments are provided with the narrative—refer to Supplemental Materials Report.*

EXECUTIVE SUMMARY:
Planning and Construction within the Division of Administration publicly advertised for Construction Manager-at-Risk (CMAR) qualifications and General Conditions fee proposals for the Science Initiative (SI) facility in October 2018. Four responses were received in November 2018. The RFQ responses were reviewed by two members of the UW Operations team, two members of the College of Engineering and a member of Parking and Transit Services the ranking of the proposals is as follows:

1. GE Johnson Construction of Wyoming
2. Haselden Construction of Wyoming
3. GH Phipps of Wyoming
4. Sampson Construction Co.

The selection committee ranked the responses by statutory selection measures which include: ability of professional personnel, past performance, schedule requirements, location, residency, current and projected workload(s), previous work awarded, and equitable work distribution.

Administration is recommending GE Johnson Construction of Wyoming as the CMAR for the Science Initiative.

PRIOR RELATED BOARD DISCUSSIONS/ACTIONS:
- January 2016 – Board of Trustees approved GSG Architecture as the designer for the SI project.
- March 2017 – The Exterior Design Advisory Committee was established
- November 2017 – Board of Trustees approved the exterior of the SI Building
- January 2018 – Board of Trustees approved Design-Bid-Build as the Construction Delivery Method for the SI Building and the final look of the greenhouses
- June 2018 – Board of Trustees approved the contract for the SI Site Clearing
- September 2018 – Board of Trustees approved revising the entry into the Science Initiative and changing the delivery method to CMAR.

WHY THIS ITEM IS BEFORE THE BOARD:
Pursuant to UW regulation 6-9 all contractor selections for capital construction projects require Board approval.

ACTION REQUIRED AT THIS BOARD MEETING:
Authorization to enter into contract negotiations with GE Johnson Construction of Wyoming, the highest ranking firm.

PROPOSED MOTION:
"I move to authorize Administration to enter into contract negotiations with GE Johnson Construction of Wyoming."

PRESIDENT'S RECOMMENDATION:

AGENDA ITEM TITLE:
 Consideration and Action: Campus Master Plan Consultant Selection, McKinley/Theobald/Kibbon

SESSION TYPE:
☐ Work Session
☐ Education Session
☐ Information Item
☒ Other:
[Committee of the Whole – Items for Approval]

APPLIES TO STRATEGIC PLAN:
☒ Yes (select below):
  ☒ Driving Excellence
  ☐ Inspiring Students
  ☐ Impacting Communities
  ☐ High-Performing University
☐ No [Regular Business]

☐ *Attachments are provided with the narrative—refer to Supplemental Materials Report.*

EXECUTIVE SUMMARY:
Campus master plans address elements such as green space, land use, new buildings, rehabilitation of buildings, repurposing of existing buildings, and traffic flow. Over the last few years, the University, with the approval and strong support of the Board of Trustees, has embarked on an aggressive campaign to significantly expand and enhance its facilities in pursuit of its missions of excellence. But such a campaign requires careful planning to ensure that all of the myriad factors that can affect the most efficient functioning of these facilities are taken into account—factors such as campus population growth, established/ emerging academic and research priorities, enhanced campus social development, preservation of historic campus elements, renovation and restoration needs, transportation, residential accommodation, land use, sustainability, local community impact and interaction, provision of utilities and communications infrastructure, and many others.

The UW campus has evolved over 130 years to become an intrinsically beautiful place. With an eye to the future, the UW needs a framework for decision making and strategic development that guides the campus's overall physical form to address infrastructure needs, environmental sustainability, and economic development.

Administration issued a Request for Proposals for consultants able to perform a Campus Master Plan. Seven firms proposed on the project and were scored by the planning team. Two of these firms were chosen for interviews including Sasaki and Smith Group.

The name of the consultant with whom Administration would like to enter into contract negotiations will be provided to the Facilities Contracting Committee at their December 2018 meeting.

PRIOR RELATED BOARD DISCUSSIONS/ACTIONS:
N/A

WHY THIS ITEM IS BEFORE THE BOARD:
Pursuant to UW Regulation 6-9, consultants selected for capital construction projects requires Board approval.

ACTION REQUIRED AT THIS BOARD MEETING:
Approval to enter into contract negations with the highest ranking firm who will be responsible for preparing the Campus Master Plan.

PROPOSED MOTION:
"I move to authorize administration to enter into contract negotiations with the highest ranking firm for the Campus Master Plan."

PRESIDENT'S RECOMMENDATION:

AGENDA ITEM TITLE:
<u>Consideration and Action: Union Visioning Study Consultant Selection</u>, McKinley/Theobald/Kibbon

SESSION TYPE:

☐ Work Session

☐ Education Session

☐ Information Item

☒ Other:

[Committee of the Whole – Items for Approval]

APPLIES TO STRATEGIC PLAN:

☐ Yes (select below):

    ☐ Driving Excellence

    ☐ Inspiring Students

    ☐ Impacting Communities

    ☐ High-Performing University

☒ No [Regular Business]

☐ *Attachments are provided with the narrative—refer to Supplemental Materials Report.*

EXECUTIVE SUMMARY:
Opening in 1939, the Wyoming Union has served for more than 75 years as the "campus living room". Additions in 1957 and 1973—and a comprehensive renovation and addition in 2002—have substantially enlarged the Union to 19,000 square feet of meeting and conference space.

The Union houses the University Store, Copy Center, a variety of dining options, and the new Center for Student Involvement and Leadership, which includes ASUW student government, Fraternity and Sorority Life, Campus Activities Center, Service, Leadership and Community Engagement, Student Media, Non-Traditional Student Center, Rainbow Resource Center, the Multicultural Resource Center, the newly renovated Veterans Center, and as of September 2018, the Visit Day Program for prospective students. The Wyoming Union is a place where students can participate in a wide variety of programs, activities, leadership, and involvement opportunities that enrich the college experience.

The Union Visioning study will focus on the adequacy of building systems, programmatic needs, potential expansion, and how the facility may be operated more efficiently.

Administration issued a Request for Qualifications for consultants able to perform a visioning study for the Union. Eight firms proposed on the project and were scored by the planning team. Three of these firms were chosen for interviews.

The name of the consultant with whom Administration would like to enter into contract negotiations will be provided to the Facilities Contracting Committee at their December 2018 meeting.

PRIOR RELATED BOARD DISCUSSIONS/ACTIONS:
N/A

WHY THIS ITEM IS BEFORE THE BOARD:
Pursuant to UW Regulation 6-9, consultants selected for capital construction projects requires Board approval.

ACTION REQUIRED AT THIS BOARD MEETING:
Approval to enter into contract negations with the highest ranking firm who will be responsible for preparing the Union Visioning Study.

PROPOSED MOTION:
"I move to authorize administration to enter into contract negotiations with the highest ranking firm for the Union Visioning Study."

PRESIDENT'S RECOMMENDATION:

AGENDA ITEM TITLE: <u>**Information: Legislative Priorities and Strategy**</u>, Brown/Asay

SESSION TYPE:

☐ Work Session

☐ Education Session

☐ Information Item

☐ Other:

[Committee of the Whole – Items for Approval]

APPLIES TO STRATEGIC PLAN:

☐ Yes (select below):

    ☐ Driving Excellence

    ☐ Inspiring Students

    ☐ Impacting Communities

    ☐ High-Performing University

☐ No [Regular Business]

☐ *Attachments are provided with the narrative—refer to Supplemental Materials Report.*

EXECUTIVE SUMMARY:

AGENDA ITEM TITLE:
Information: Legislative Priorities and Strategy: Blockchain Update, Brown/Asay

SESSION TYPE:
☐ Work Session
☐ Education Session
☐ Information Item
☐ Other:
[Committee of the Whole – Items for Approval]

APPLIES TO STRATEGIC PLAN:
☐ Yes (select below):
    ☐ Driving Excellence
    ☐ Inspiring Students
    ☐ Impacting Communities
    ☐ High-Performing University
☐ No [Regular Business]

☒ *Attachments are provided with the narrative—refer to Supplemental Materials Report.*

EXECUTIVE SUMMARY:
Legislative Summary: Brown and Asay will present topics that impact the University of Wyoming that are expected to be issues for legislative action in the 2019 legislative session. This agenda item will include an update on the work of the University with the Legislature throughout the interim.

Blockchain program proposal: During the 2018 legislative session, the legislature created a blockchain task force. This group of legislators and non-legislators spent the interim studying the technology and determining how the state could capitalize on its legislative action (in 2018 the state passed multiple pieces of legislation that would allow Wyoming to be a friendlier environment than other states for companies using/creating this technology). The task force determined that a supportive environment includes an educational component and thus asked Professor and Head of the UW Computer Science department, Jim Caldwell, to present about what UW is already doing to support blockchain technology and asked him to create and present a proposal on how the university could support a multi-disciplinary blockchain technology program. See attached.

As Dr. Caldwell did not have the time to present this program proposal to the Board of Trustees before he presented it in response to the legislative/task force request, he told the Task Force that the proposal had not received the support of the Trustees at the time of his presentation. After the presentation, the chairs of the Task Force wrote a letter to the Board of Trustees requesting the Trustees receive information about the program and respond to the Task Force with a recommendation on the feasibility of developing such a program.

PRIOR RELATED BOARD DISCUSSIONS/ACTIONS:
A legislative summary is offered periodically to the Board of Trustees.

WHY THIS ITEM IS BEFORE THE BOARD:
The Blockchain Task Force wrote a letter to the Board of Trustees dated November 21, 2018 requesting a response and also requesting a recommendation from the Board with regard to the feasibility of developing a blockchain technology educational and research program at the University of Wyoming in the near future. As a part of this recommendation, the Task Force asked the Board of Trustees include any necessary funding requirements to be considered during the 2019 legislative session.

ACTION REQUIRED AT THIS BOARD MEETING:
Board action requested would be to agree on a response to the Blockchain Task Force.

PROPOSED MOTION:
To be determined.

PRESIDENT'S RECOMMENDATION:
President recommends responding to the request of the Task Force.

December 12, 2018

Chairmen Driskill and Lindholm
Blockchain Task Force
Legislature of the state of Wyoming
XXX

Re: Blockchain Education and Research Program at the University of Wyoming

Dear Chairmen Driskill and Lindholm,

On November 21, 2018, you sent a letter to the University of Wyoming Board of Trustees (Trustees) requesting the Trustees consider a proposal for a blockchain education and research program and provide a recommendation to the Task Force regarding the feasibility of developing such a program at UW. As part of the recommendation, you also requested the Trustees consider funding requirements for the implementation of the program.

President Nichols and her administration have worked with the Colleges of Agriculture and Natural Resources, Business, and Engineering and Applied Science to revise the proposal to reflect the expected costs of implementation.

The proposal anticipates an interdisciplinary Blockchain Certificate Program, an interdisciplinary FinTech Certificate Program, and the resources to teach introductory courses on blockchain technology. In order to begin the programs in August of 2020, the university would need a combination of expendable, on-going funds and an endowment. As stated in the proposal, expendable funds would allow for the initiation of searches in the Fall of the academic year following the appropriation. Endowed funds would allow for ongoing support to the program for faculty retention, addressing ongoing research and computing equipment needs, travel, and to support blockchain outreach activities.

On-going state support would be needed to fund four new faculty positions, including: two new faculty positions in Computer Science, one new faculty position in Agriculture and Applied Economics and one new faculty position in Finance. The total amount of necessary on-going support for these faculty would amount to slightly over $831,000 per year (see budget table in proposal). In addition to this on-going support, startup funds would be necessary to get the new faculty and new programs up and running. These startup funds are estimated to be in the amount of $635,000 over the first two years of the programs. The Deans of the Colleges of Agriculture and Natural Resources, Business, and Engineering and Applied Science believe they could reprioritize their budgets in order to cover the startup costs for these programs.

Finally, the proposal includes a 2 to 1 matching opportunity. If the State were to put forward $1 million dollars for an endowment, the Colleges, along with the UW Foundation, would commit to finding donors to match that amount with $2 million.

The Trustees are encouraged by the confidence the Task Force has in the university to implement these new programs. However, the university's deadline for making requests for additional state funds for FY2020 has come and gone.

If you have any questions, please feel free to contact me, or the University of Wyoming's Interim Director for Government Relations, Meredith Asay (masay@uwyo.edu) with any questions or concerns.

Sincerely,

Dave True

DRAFT

LEGISLATURE *of the* STATE *of* WYOMING

BLOCKCHAIN TASK FORCE

November 21, 2018

Board of Trustees
University of Wyoming
206 Old Main
Laramie, WY 82071

Re: Blockchain Education and Research at the University of Wyoming

Dear Trustees,

The Wyoming Legislature recently enacted pioneering blockchain legislation which has positioned our state as an international leader in this emerging field.[1] As part of these new laws, the Legislature also created a seven-member task force of legislators and industry leaders to consider emerging blockchain issues and propose legislation to continue Wyoming's leadership in this area.

At its October 29, 2018 meeting, the Blockchain Task Force discussed the development of an interdisciplinary blockchain education and research program at the University of Wyoming with Dr. James Caldwell, Head of the Department of Computer Science and Dr. Richard McGinity, President Emeritus.

Dr. Caldwell and others[2] provided Task Force members with a draft proposal envisioning the hiring of four faculty members (two, Department of Computer Science; one, Department of Accounting and Finance; and one, Department of Agricultural and Applied Economics), as well as the creation of a certificate or major program relating to blockchain technology. A combination of state funds and endowed matching funds would be used to hire faculty and develop the program.

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[1] *See, e.g.,* Ben McLannahan, *Wyoming's Pioneering Crypto Cowboys Beef Up the Supply Chain*, FINANCIAL TIMES, JULY 1, 2018, https://www.ft.com/content/da69a410-6972-11e8-b6eb-4acfcfb08c11; Benjamin Bain, *Wyoming Aims to Be America's Cryptocurrency Capital*, BLOOMBERG, MAY 15, 2018, https://www.bloomberg.com/news/articles/2018-05-15/wyoming-aims-to-be-america-s-cryptocurrency-capital; Alexander Davis, *Davis's Take: Crypto Cowboys Ready to Lay Down the Law*, WALL ST. J., MAR. 8, 2018, https://www.wsj.com/articles/daviss-take-crypto-cowboys-ready-to-lay-down-the-law-1520512200.
[2] Dr. Benjamin Rashford, Head, Department of Agricultural and Applied Economics; Dr. Nicole Choi, Chair, Department of Accounting and Finance.

The Task Force was also informed that this proposal has the support of the respective deans of the Colleges of Engineering, Agriculture and Business.

The State of Wyoming has a unique opportunity to build upon recent blockchain successes through a partnership with the University. This partnership would enable the development of future Wyoming programmers, technology entrepreneurs and industry leaders, and also facilitate cutting-edge research in a thriving, interdisciplinary space at the crossroads of technology, agriculture, finance, economics and the law.

The Task Force requests that the Board of Trustees consider the attached proposal and provide a recommendation to the Task Force regarding the feasibility of developing a blockchain education and research program in the near future at the University. As part of this recommendation, we would be grateful if you could include any necessary funding requirements for consideration in the 2019 General Session.

Please contact Task Force staff Chris Land at (307) 777-7108 or chris.land@wyoleg.gov if you have any questions or concerns. If possible, please provide the recommendation of the Board by Monday, January 7, 2019 to Mr. Land for distribution to the Task Force.

With best wishes,

Rep. Tyler Lindholm
Co-Chairman,
Blockchain Task Force

Sen. Ogden Driskill
Co-Chairman,
Blockchain Task Force

Attachment

cc: Dr. Laurie Nichols, President
    Dr. Richard McGinity, President Emeritus
    Meredith Asay, Esq., Government Relations Director
    Dr. James Caldwell, Head, Department of Computer Science
    Dr. Michael Pishko, Dean, College of Engineering and Applied Science
    Dr. Bret Hess, Interim Dean, College of Agriculture and Natural Resources
    Dr. David Sprott, Dean, College of Business
    Members, Blockchain Task Force

Building a Sustainable, Interdisciplinary, Blockchain Education and Research Program at the University of Wyoming

A proposal in response to a request from the
Wyoming Blockchain Task Force

14th November 2018
(Previous Version: 29th October 2018)

James Caldwell[1] Benjamin Rashford[2] Nicole Choi[3]

Abstract: Blockchain legislation was unanimously passed by the Wyoming House of Representatives and Wyoming Senate and was signed into law in on March 10, 2018, by Governor Mead. This legislation has established Wyoming as a leader at the international forefront of a new technology that promises to dramatically affect the lives of individual citizens, business practices, the day to day processes of government, as well as international trade and relations[4] [5]. The legislation puts Wyoming in the unique position of being a focus of the international community of blockchain technologists. As a direct result of the legislation, a number of blockchain companies have shown significant interest in (re)locating to Wyoming. For Wyoming to capitalize on this unprecedented opportunity to diversify the economy, workforce development in this highly technical area will be crucial. Establishing the University of Wyoming as a leader in blockchain education, research, and applications is perhaps the only path to this goal. A blockchain education and research program based at the University of Wyoming will benefit the State, businesses in Wyoming, the University, and the students who attend UW.

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[1] Professor and Head, Department of Computer Science, University of Wyoming.
[2] Associate Professor and Head, Department of Agricultural and Applied Economics, University of Wyoming
[3] Associate Professor and Chair, Department of Finance, University of Wyoming
[4] Deloitte, Blockchain - Perspectives, insights, and analysis.
https://www2.deloitte.com/us/en/pages/consulting/topics/blockchain.html,
[5] *Deep shift: Technology tipping points and societal impact*, World Economic Forum, September 2015, weforum.org.

1

Blockchain (Distributed Ledger Technology): An Introduction

Blockchain is a new technology that is used to implement secure, distributed, immutable, ledgers. The term *Distributed Ledger Technology* is, in many quarters, replacing the term *blockchain.*

A secure, immutable, distributed ledger is a perfect vehicle for cryptocurrency, but has many other applications. It is useful in any application where multiple parties, who may not necessarily trust one another or, more generally, when the various parties to a transaction may have a different stake in the transaction. It is applicable when multiple parties need to update a common database (ledger) where transactions can be verified by all parties. Currently, such applications are typically mediated by legal contracts, central trusted authorities, or governmental institutions. A fundamental feature of the new technology is that blockchains are being used to decentralize control by replacing institutional trust with digital trust. Digital trust in a blockchain transaction is established by the fact that the ledger is immutable and distributed and can be inspected by all parties.

Blockchain technology saw its first significant application in the Bitcoin cryptocurrency, first introduced in 2009. Since then, no one has been able to hack the bitcoin blockchain, providing an indisputable proof of concept. Because Bitcoin and other cryptocurrencies use a blockchain does not mean blockchains are necessarily cryptocurrencies, in fact, most applications are not related to cryptocurrency.

Because the first significant application of blockchain was in the cryptocurrency world it can be useful to understand how it works there. Bitcoin uses a blockchain to solve the double spending problem providing users with a mechanism that guarantees everyone in the community can trust the record of transactions. Perhaps the most fundamental aspect of any currency is to avoid the possibility that the same unit of currency can be spent twice by the same person. A blockchain is a data-structure that implements a secure, immutable, distributed ledger for recording transactions. In the case of bitcoin, it keeps track of who owns which bitcoin. The ledger is immutable because there is a real world cost (in the form of computational effort, *i.e.* electricity) to add a new block extending the existing blockchain. There is a reward for being the first to complete the computation which allows the blockchain to be extended. The fact that adding a block incurs a significant cost gives a *"Proof of Work"* guarantee to the other parties competing to add the next block to the chain. The reward provides the incentive for many parties (*miners*) to compete to add the next block. The ledger is immutable because the work performed is to build a cryptographic link to previous blocks in the chain. Because blocks are linked cryptographically, and since it is computationally expensive to add even one block, changing the historical record of transactions is infeasible. Anyone/everyone can have a copy of the blockchain, it is *distributed*. Verifying that the work (required to add a block to the chain) was properly done is accomplished by a simple inexpensive computation, so while it is expensive to add a block, verifying that the work was actually performed is essentially free. The security of the chain provides for the *immutability* of the blockchain which also provides a form of digital *trust.* Trust in a decentralized blockchain is warranted because of its immutability and because

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there are many, many duplicate copies spread across the network. Even if it was feasible to change one, it is not feasible to change them all.

Corporate Blockchain Investments, Jobs, and Universities

Significant investments in blockchain technology have already been made by many major corporations. The applications areas are as varied as retail, entertainment, supply chains and logistics, oil and gas[6], insurance, supply chain management[7], healthcare, real estate, charity, financial services, journalism, credentialing (of students and others), and transportation and shipping. The list grows continually, but uses of blockchain in the area of food supply-chain applications are among the best developed so far. Among the early adopters is Walmart.[8].

The blockchain job market is booming for workers with skills in the technology or its application.[9] [10] Blockchain positions are among the highest paying.[11] These are the kind of jobs we'd like to attract to Wyoming and blockchain is the kind of cutting edge technology ecosystem we'd like to prepare University of Wyoming students to thrive in.

Blockchain classes are being offered at many top universities[12] and are reported to be among the most popular courses being offered[13]. The Computer Science Department at the University of Wyoming has been offering a blockchain related course or content since the Fall 2017 semester. Other departments in the university are similarly starting to introduce blockchain related content.

ENDOW

In November 2016, Governor Mead established the ENDOW[14] Initiative to diversity the Wyoming economy with the goal of making it less tied to the ups and downs of the cyclical oil and gas markets. Among the ENDOW recommendations are to embrace change and disruptive technologies. Building on the legislation passed in 2018, Blockchain technology is exactly the kind of technology Wyoming hopes to target. The Wyoming legislation, modeled on Swiss

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[6] https://media.consensys.net/ondiflo-blockchain-for-oil-and-gas-9de5e01cd680
[7] How Blockchain Will Transform The Supply Chain And Logistics Industry, B. Marr, Forbes, March 23, 2018
https://www.forbes.com/sites/bernardmarr/2018/03/23/how-blockchain-will-transform-the-supply-chain-and-logistics-industry/#64c8c4a65fec
[8] https://www.nytimes.com/2018/09/24/business/walmart-blockchain-lettuce.html
[9] As one example, the number of job advertisements at indeed.com are up over 200% since last year, and over 600% the year before. Joe Lubin, CEO of Consensus, reported 16 open positions for every blockchain qualified job seeker.
[10] https://www.computerworld.com/article/3235972
[11] https://www.indeed.com/salaries/Blockchain-Salaries ranging from $51,00 (Marketing) to $146,621 per year for Principal Software Engineer.
[12] https://www.wired.com/story/latest-course-catalog-trend-blockchain-101/
[13] https://www.insidehighered.com/news/2018/08/13/rising-profile-blockchain-academe
[14] ENDOW: Economically Needed Diversity Options for Wyoming.

regulations, is the first of its kind in the US[15]; there are pending bills in at least seven states that emulate the Wyoming. The State, the University, the Wyoming Business Council, and others have made many efforts over the years to attract more tech companies to Wyoming. The blockchain legislation passed last year has heightened interest in Wyoming among many of the leaders in the blockchain community. This broad interest from a booming tech sector is a once in a generation opportunity for Wyoming. The fortuitous timing and confluence of events is one that could not have been planned, it is an opportunity for the State and the University.

The plan outlined here explicitly addresses a number of the goals outlined by ENDOW. Blockchain is explicitly mentioned in the Transforming Wyoming report as a disruptive technology the state should embrace.[16] The same report says, "We must be a state of innovators and swiftly develop the necessary ecosystem for new technologies to thrive." This plan addresses that goal in the context of the new, blockchain friendly environment created by the new legislation.

University of Wyoming Strategic Plan
The plan presented here is entirely consistent with the University of Wyoming Strategic Plan[17] and directly addresses a goals as outlined below.

Goal 1: Driving Excellence - As blockchain applicaations are inherently *interdisciplinary* are, in essence, *entrepreneurial*, this plan address the subgoal to develop such programs. The program here directly addresses *workforce development* by offering students the opportunity to be certified in the new technology which is in high demand across the country. Blockchain based companies looking to relocate to Wyoming are specifically seeking these skills.

Goal 2: Inspiring Students - There are a few existing online blockchain programs, but none (yet) are being offered by accredited universities. This is likely to change quickly, but an *online certificate programs* could attract significant *enrollment* from professional looking to enhance their *credentials* in the area.[18]

Goal 3: Impacting Communities - The *outreach* opportunities are already here, with the department of Agricultural and Applied Economics receiving requests for extension programs that address applications of blockchain technologies in agriculture. Beef Chain is an example of a home grown Wyoming LLC that is already applying this technology to cattle ranching with the help of UW faculty memers in the departments of Computer Science, Agricultural and Applied Economics, and Finance. As described above, the program explicitly addresses a number of

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[15] While there are regulatory environments elsewhere in the world, the Wyoming legislation is the first passed by an elected body anywhere in the world.
[16] Transforming Wyoming: 20-Year Economic Diversification Strategy, ENDOW, August 2018.
[17] BREAKING THROUGH: 2017-2022: A Strategic Plan for the University of Wyoming, July 10, 2017
[18] As evidence for this claim, online M.S. program in Computer Science are a significant source of revenue at many colleges and universities.

goals of *ENDOW*. If they are carefully designed, online certificate Blockchain and FinTech programs may well be taken by graduates in appropriate degree programs at *Wyoming Community Colleges*. This would provide a certification beyond the AA or AS degree, but would require fewer courses than a full B.S.

The Proposal

Blockchain technology is inherently interdisciplinary. Blockchains work because of a combination of deep results from both computer science and economics. From *computer science*, blockchains are built on the theory and implementation of trusted distributed computing systems, distributed consensus algorithms, sophisticated data-structures, and digital cryptography. On the *economics* side are finance, contracts, monetary theory, behavioral economics, the new field of cryptoeconomics, supply chains, and game theory. The number of application areas is growing quickly, but applications to the supply chain for foods is perhaps the most mature.

To build a sustainable blockchain education and research program we propose to add four new faculty position to the University of Wyoming across three colleges and three departments. There will be two positions in the College of Engineering and Applied Sciences in the Department of Computer Science, one position in the College of Business in the Department of Finance, and one position in the College of Agriculture in the Department of Agricultural and Applied Economics.

Blockchain is such a new technology that there essentially are no senior level experts, so we are proposing hiring Assistant Professors and/or Professors of Practice. The expectation is that this cohort of four new faculty members will:

> i.) offer introductory courses in the areas of blockchain tecnology and finance,
> ii.) collaborate in developing and offering a robust *blockchain certificate program*,
> iii.) support an interdisciplinary *FinTech*[19] *certificate program*,
> iv.) will work together to obtain research funding and run interdisciplinary projects, and
> v.) will serve as a resource to the State of Wyoming on blockchain related matters.

In order to start this program as early as possible (new faculty starting in August 2020) we recommend that funding take the form of a combination of expendable and endowed funds. Expendable funds will allow for the initiation of searches in the Fall of the academic year following the appropriation. Endowed funds will allow for ongoing support to the program for faculty retention, addressing ongoing research and computing equipment needs, travel, and to support blockchain outreach activities.

College of Engineering and Applied Sciences - Department of Computer Science (2 positions)
Within the computer science field, blockchain technology depends primarily on two areas,

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[19] *FinTech* is the application of computational methods, big data, and blockchain (tech) to problems in Finance

trusted distributed computing and cryptography. The two faculty hires will be in some combination of the two areas. For Assistant Professors, we expect the standard requirements, i.) a Ph.D. in computer science or a closely related field, ii.) evidence of the ability to do research in the areas mentioned above, evidence typically takes the form of a publication record in peer-reviewed conferences and/or journals, iii.) evidence of teaching excellence, and iv.) a desire to help in blockchain related outreach activities in the state. A Professor of Practice position will require, i.) evidence of industrial experience in the blockchain space, ii.) with a desire to teach, iii.) advising Wyoming based companies looking to build blockchain based applications, iv.) participate in blockchain based outreach activities in the state. Having two faculty in Computer Science will allow the department to offer introductory level programming courses to a broad segment of the student population and to offer advanced courses to support certificate programs in Blockchain and a FinTech certificate. Both areas directly address the workforce issues the state fasces in the blockchain and tech areas.

College of Business - Department of Accounting and Finance (1 position)
Economics and Finance have played a significant role in the development of blockchain based technologies. As important as the computer science contributions, consensus based on competition, proof of work, proof of stake, and other mechanisms yet to be discovered, are based in economics and finance.

In the field of Finance, the desired skill set for an assistant professor would include the standard academic hiring requirements such as: i) a Ph.D. in finance, economics or closely related field, ii) evidence of the ability to do research and publish blockchain related papers in high-quality peer-reviewed journals, iii) expertise in various forms of financial markets and securities, iv) ability to integrate the technological advances in the area of blockchain into the finance curriculum, v) ability to aid in developing the blockchain and fintech certificates. A professor of Practice position would require significant experiences in related industries, without a requirement for a Ph.D. degree. discussions about blockchain based systems, and iv.) a willingness to do educational outreach to industries in Wyoming seeking to adopt blockchain technologies. A Professor of Practice position will trade off the Ph.D. and publication requirements for an individual with real-world experience in the blockchain space.

College of Agriculture - Department of Agricultural and Applied Economics (1 position)
Supply chains are ubiquitous in all aspects of agriculture and food safety, and provenance is a difficult problem with growing importance. Blockchains are being used as a way to prove safety and provenance and are already having a significant impact on business practices in the agricultural industry. On the safety side, the technology will provide the means of targeting food recalls based on fine grained assessments of identified sources of contamination. More and more, consumers demand knowledge about where the food they eat comes from and blockchains provide the technology to make this information available. As mentioned before, blockchains are already having an impact with Walmart, Kroger, and others investing heavily in the technology. In addition to blockchain, 'big data' more generally continues to transform the

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agricultural industry at a rapid pace - from satellite imagery and drone data, to field sensors and RFID traceability technology, to scanner and internet data on consumers - data availability is influencing every step in the food supply chain. A new position in Agricultural and Applied Economics will ensure the University of Wyoming has the expertise and capacity to stay at the cutting edge of these developments in agriculture, to train the future leaders of agriculture in the state and beyond, and to conduct research and outreach that contributes to economic development in the agricultural sector.

The basic requirements for an Assistant Professor in Agricultural and Applied Economics will include: i) a PhD in Agricultural and Applied Economics or a related field, ii) a demonstrated record of effective teaching, iii) evidence of the ability to do research and publish in high-quality peer-reviewed journals in the field, and iv) expertise in agricultural supply chains and agribusiness. In addition to these basic requirements, the new faculty member for this position will be expected to have: i) research and teaching experience related to big data applications in agriculture; ii) a track record of effective interdisciplinary teaching and research; and iii) demonstrated experience in outreach and engagement, and an interest in working with producers and policymakers to provide applied expertise on blockchain technologies and other big data applications in the State of Wyoming.

Budget

At the request of the Wyoming Blockchain Task Force, Prof. Caldwell and President Emeritus Richard McGinity presented an earlier version of this proposal at the Cheyenne Task Force meeting on October 29, 2018.   At that meeting the Task Force voted unanimously to send a letter to President Nichols and the University of Wyoming Trustees that they intended to write legislation to appropriate funds.   The budget in the original proposal had been shared, but not vetted with the University Administration. The revised budget below is based on recommendations from President Nichols and other administrators.

The request is for a continuing legislative appropriation of ~$830,000 per year to support *four new faculty positions* at the university: two in the Computer Science Department; one in the Finance Department; and one in Agricultural and Applied Economics. *Startup funds* to support the new faculty would be spent over the first two years and would be covered by the University and Colleges housing the department homes of the new faculty. Additionally, an endowment fund in the amount of $3,000,000 would be raised over 5 years with a 2:1 match by the UW Foundation, $1,000,000 from the state and $2,000,000 raised by the Foundation. State matching funds would become available (for up to 5 years) when letters of commitment from donors are been obtained by the Foundation.

		Yearly		Totals
NEW FACULTY (State Funding)				
Computer Science 1	Salary	$135,000		
	Fringe 43.3%	$58,455		
Computer Science 2	Salary	$135,000		
	Fringe 43.3%	$58,455		
	SubTotals	$386,910		$386,910
Finance	Salary	$185,000		
	Fringe (43.3%)	$80,105		
	SubTotals	$265,105		$265,105
Agricultural Economics	Salary	$125,000		
	Fringe (43.3%)	$54,125		
	SubTotals	$179,125		$179,125
YEARLY PERSONNEL EXPENDITURES		$831,140		$831,140
FACULTY STARTUP (UW funding)		Year 1	Year 2	
Computer Science 1		$125,000	$125,000	
Computer Science 2		$125,000	$125,000	
Finance		$45,000	$40,000	
Agricultural Economics		$25,000	$25,000	
SubTotals		$320,000	$315,000	$635,000
ENDOWED MATCHING FUNDS				
State		$1,000,000		$1,000,000
UW Foundation Match (2 to 1)				
College of Engineering and Applied Sciences		$931,034		
College of Business		$637,931		
College of Agriculture		$431,034		
SubTotals		$2,000,000		$2,000,000
Total Endowment				$3,000,000
Faculty Expenditures		Year 1	Year 2	Year 3 on
Continuing STATE Funding / Faculty		$831,140	$831,140	$831,140
Startup Funding (over 2 years) UW part		$320,000	$315,000	0
		$1,151,140	$1,146,140	$831,140
Endowment		Withnin 5 years		
STATE Funded Endowment		$1,000,000		
UW Foundaition Matching funds (2:1 match)		$2,000,000		
TOTAL		$3,000,000		

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New Educational Programs enabled by this Proposal

The specific programs at the University of Wyoming that will be enabled by the proposed funding include an interdisciplinary *Blockchain Certificate Program,* an interdisciplinary *FinTech Certificate Program,* and the resources to teach *introductory courses on blockchain technology.* Certificate programs will be offered online and we believe will prove very popular with professionals already in the workforce. These would be the first such programs available in the region. As mentioned above, blockchain courses at other universities have been among the most popular on their respective campuses. There will be real synergy between the courses offered for the certificates, with, some courses counting toward more than one certificate.

Also, new faculty will be training graduate students will be trained at the M.S. and Ph.D. levels. Students graduating with advanced degrees will be a crucial component of a workforce development strategy for companies looking to establish operations in Wyoming, the region, and the nation.

We expect the combination of introductory courses and online certificate programs will attract students to the University of Wyoming who would not have otherwise come. At this point, it is difficult to predict actual numbers, but that analysis is part of the established certificate approval program.

Online Blockchain Certificate Program - The blockchain certificate program will include approximately four to five courses that will be designed so that students from a number of disciplines (though not all) will be able to add the certificate to their program of study without delaying a four year graduation. This will certainly be true for students with majors in the three departments included here, but also, we expect majors in other disciplines will be able to integrate the blockchain certificate onto their programs of study. Certainly, students in a number of other Engineering, Business, and Agriculture degree programs will be able to do this. Course topics will include both blockchain system design and programming, the economics and finance of blockchain, designing smart contacts, and an interdisciplinary applications course that will serve as a capstone.

Online FinTech Certificate Program - FinTech (Financial Technology) is the integration of technology to facilitate and automate financial applications. This topic is broader than blockchain alone, it also must include data analytics, artificial intelligence, and machine learning. The faculty hired under this proposal will provide the support for teaching blockchain technologies to students pursuing this certificate. The certificate will include four or five courses in Finance and Computer Science to enable students studying in various majors to obtain the fintech certificate. Computer Science and Business students will be able to add this certificate into their program of study without delaying a four year graduation. We expect students in other disciplines to be able to do so as well.