BOARD OF GOVERNORS
STATE UNIVERSITY SYSTEM OF FLORIDA

NEW DOCTORAL DEGREE PROPOSAL STAFF ANALYSIS

Program: Ph.D. in Informatics and Big Data Analytics
CIP Code: 11.0104
Institution: University of South Florida
Proposed Implementation Date: Fall 2020
Staffed By: Disraelly Cruz
Initial Review Date: 8/6/2019 **Last Update: 10/14/19**

Projected program costs:

	Total	% & $ Current Reallocated	% & $ New Recurring	% & $ New Non-Recurring	% & $ C&G	% & $ Philanthropy & Endowment	Auxiliary Funds	Cost per FTE	SUS 17-18 Average Cost per FTE
Year 1	$228,031	100% $195,731	0% $0	0% $0	0% $0	0% $0	$32,300	$48,933	$17,651.76 11 CIP
Year 5	$347,786	100% $250,886	0% $0	0% $0	0% $0	0% $0	$96,900	$16,726	

Projected FTE and Headcount are:

	Student Headcount	Student FTE
First Year	4	4
Second Year	8	8
Third Year	13	13
Fourth Year	14	14
Fifth Year	15	15

On March 29, 2007, the Florida Board of Governors approved Board Regulation 8.011, which sets forth criteria for implementation and authorization of new doctorates by the Board of Governors, as well as criteria for implementation and authorization of Bachelor's, Master's and Specialist degrees by Boards of Trustees. The following staff analysis is an assessment of how well the university meets Board Accountability and Readiness criteria for implementation of this degree program.

Proposal Page Numbers:

INTRODUCTION		ACCOUNTABILITY		READINESS				
Program Description	BOG Goals	Overall	Budget	Mission and Strength	Program Quality	Curriculum	Faculty	Resources
2	10	12	20	24	28	28	39	43

A. Program Description:

The University of South Florida's Muma College of Business is proposing to establish a doctoral program in informatics and big data analytics. The interdisciplinary program will include participation from the Colleges of Arts & Sciences, Business, Engineering, and Public Health. The proposed program will train students in both the human and technical components of big data analytics. Graduates of the program will be trained to manage large data, write code, develop models, and build systems, all the while considering potential bias and ethical issues (p. 2).

The Ph.D. in Informatics and Big Data Analytics will require the completion of a minimum of 72 credit hours beyond the bachelor's degree, practicum experience, qualifying exams, and dissertation. For students who are accepted into the program with a master's, up to 12 credit hours may be transferred at the discretion of the Doctoral Program Committee (p. 30).

B. System-Level Analysis and Evaluation in accordance with BOG Regulation 8.011:

The proposal documents the program's alignment with the State University System's (SUS) Strategic Plan, national and state workforce needs, and student demand. A doctoral degree in informatics and big data analytics meets several of the SUS's Strategic Plan's goals in the areas of academic and research excellence. Specifically, the doctoral program will increase STEM degree productivity by training students in the human and technical aspects of big data analytics. The interdisciplinary nature of the program will create additional opportunities for cross-disciplinary research, and the inclusion of a practicum experience encourages students to engage with industry partners on a real-world big data analytics project, in-turn benefitting the student, university, and community partners. More importantly, a program of this nature responds to growing national and state workforce demands.

Need for Graduates in the Labor Market

Although big data analytics is an emerging field, the proposal strongly documents the need for doctorates in both the private and public sectors. Citing a report on the impact of big data on mathematics-based occupations[1], the proposal notes that big data related

[1] Michael Rieley, "Big data ads up to opportunities in math careers," *Beyond the Numbers: Employment & Unemployment,* vol. 7, no. 8, U.S. Bureau of Labor Statistics, June 2018, last retrieved on August 8,2019 from

jobs are among the 30 fastest growing occupations in the United States (p. 13). According to this report, mathematical science occupations are expected to grow 27.9% by 2026. Another report from the Bureau of Labor Statistics (BLS) notes that with the increased use of big data to inform decision-making, there are increased concerns regarding privacy, security, and confidentiality[2]. The proposed program meets both of these needs by training students in technical aspects of informatics and data analytics while also instructing on ethics, privacy, cognitive bias, and storytelling. Lastly, a recent *Bureau of Labor Statistics* employment projections, released September 4, 2019, lists a 12.7% increase in computer and mathematical occupations[3] by 2028.

Since big data analyst is not a current occupational category in the BLS's *Occupational Outlook Handbook,* the proposal uses the job outlook growth in adjacent careers (e.g., computer and information research scientists, operations research analysts, market research analysts, and information security analysts) to demonstrate labor market need (p. 14). Independent analysis by board staff, illustrated in Table 1, supports the argument that related careers are experiencing faster than average job growth both nationally and in the state of Florida.

To further assess the need for big data analysts, board staff conducted a search on Indeed.com on September 4, 2019. The search yielded over 30,000 job postings. In Florida alone, there were over 800 openings. The careers spanned a variety of fields including business, social science, computing, and health. For example, Florida Blue has an opening for a data analytics consultant who will manipulate large datasets and use the information to identify key business drivers. NBC Universal has an opening in Orlando for a data scientist who will focus on consumer behavior, promotional response models, and customer relationship management. Nielson has an opening for a data scientist to be a part of their digital team working on digital panel products. Many of these positions require a bachelor's or master's and one to three years of experience. However, some openings, such as Universal Orlando's opening for a data scientist of advanced analytics, require either experience or a combination of experience and education.

Notably absent from this search were entry-level careers that required a doctorate. A supplemental search, conducted on September 4, 2019, for careers on Google Careers' website yielded 161 openings that required or preferred a doctorate degree. These openings included careers as a quantitative business analyst and software engineer. Facebook's requirements for data analytics positions require that the individual has or is

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https://www.bls.gov/opub/btn/volume-7/big-data-adds-up.htm.

[2] Katie Clark Sieben, "Labor markets in 2040: Big data could be the big deal for jobseekers," *Monthly Labor Review*, U.S. Bureau of Labor Statistics, February 2016, last retrieved on August 7, 2019 from https://doi.org/10.21916/mlr.2016.6.

[3] "Employment by Major Occupational Group," *Bureau of Labor Statistics,* retrieved from https://www.bls.gov/emp/tables/emp-by-major-occupational-group.htm on September 4, 2019.

pursuing a Ph.D. in computer science, operations research, statistics, or related field[4]. While Table 1 lists entry-level education as either bachelor's or master's degree, there

[4] Job posting retrieved from https://www.facebook.com/careers/jobs/387405225294114/ on September 4, 2019.

Table 1: Labor Market Demand for Informatics, CIP Code 11.0104, and Statistics, CIP 27.0501

Occupations	Employment Change (Percent)		Annual Average Job Openings		Employment Change (Number)		BLS Typical Education Needed for Entry
	FL, 2018-26	National, 2016-26	FL	National	FL , 2018-26	National, 2016-26	
Computer and Information Research Scientists	8.8	19.2	43	2,500	48	5,400	Master's degree
Software Developers, Applications	26.5	30.7	3,904	85,700	9,922	255,400	Bachelor's degree
Software Developers, Systems Software	13.3	11.1	1,441	32,900	2,288	47,100	Bachelor's degree
Statisticians	34.8	33.8	123	4,400	331	12,600	Master's degree
Survey Researchers	10.9	2.5	52	1,400	52	400	Master's degree

Sources:
U.S. Bureau of Labor Statistics – https://www.bls.gov/ooh
Florida Department of Economic Opportunity - http://www.floridajobs.org/labor-market-information/data-center/statistical-programs/employment-projections

is evidence that some larger technology and computer organizations are steering towards the Ph.D. as an entry-level education requirement.

In reviewing the job postings, board staff noted the variety of subjects listed under qualifications. Degree subject areas included statistics, business administration, computer science, healthcare administration, and others. This finding further supports the need for an interdisciplinary curriculum that will train students in statistics, computational science, and decision-making.

In addition to the private sector, graduates of the program may choose an academic route. Utilizing a survey conducted by the Computer Research Association, the proposal uses the increase in graduate degree production (8.3%) as an indicator of increased interest in the discipline (p. 15). Board staff conducted a search on the Chronicle of Higher Education's[5] job board on August 8, 2019, and found 90 academic job postings at the assistant, associate, or full professor level. As this is an emerging field and this will only be the second data science doctoral program in the State University System, it is expected that the discipline will continue to grow in the upcoming years.

Student Demand for the Program

Surveys and focus groups were conducted to assess demand for a program in informatics and data analytics. In spring of 2019, students in the University of South Florida's Master of Science of Business Analytics & Information Systems program were asked their thoughts on an interdisciplinary program in data science and about their interest in pursuing a degree in this program (See Appendix F for open-ended survey responses). Of the 47 respondents, 24 expressed interest in pursuing a doctoral program (p. 17). Additional efforts were made to assess student demand. Focus groups conducted at college-sponsored events found that participants were interested in pursuing a graduate degree in order to advance their careers. Additionally, the college consulted with the University of Florida's (UF) Human-Centered Computing program (HCC), which is the only other program in the SUS under CIP 11.0104. The HCC receives over 1,000 applications to its three doctoral programs (i.e., Computer Science, Computer Engineering, and Human-Centered Computing), but it only accepts about 30 students into the HCC program (p. 17). Tables 2 and 3 show the enrollment and degree headcounts for the HCC programs which was implemented fall of 2016.

Within the SUS, the doctoral program in informatics and big data analytics would be the second doctoral program offered in CIP 11.0104, the second with a focus on data science, and the first with an interdisciplinary curriculum that covers computing, decision-making, ethics, and statistics. A curriculum comparison was conducted for the three programs and found that all three programs are vastly different. The University of

[5] Retrieved from https://chroniclevitae.com/job_search/new on August 8, 2019

Table 2: Historical Enrollment (Fall Headcount), CIP Code 11.0104

Institution	2016	2017
UF	30	36
Grand Total	**30**	**36**

Source: Board ODA analysis of enrollment by CIP, retrieved August 6, 2019 from the State University Database System.

Table 3: Historical Degrees Awarded, CIP Code 11.0104

Institution	2017-2018[6]
UF	5
Grand Total	**5**

Source: Board ODA analysis of degrees awarded by CIP, retrieved August 6, 2019 from the State University Database System.

Florida's HCC (CIP 11.0104) doctoral program, a 90 credit hour program, focuses on human-centered interaction and design of user-centered technologies and innovations (p. 18). The University of Central Florida's program in big data analytics (CIP 27.0501), a 72 credit hour program, is housed in their Department of Statistics and has a strong emphasis on statistical computing (p. 18). The proposed doctoral program seeks to provide an interdisciplinary education, making it a unique doctoral program in the SUS.

The projected headcount for the proposed program will be four the first year with five students admitted annually in the consecutive years (p. 19). Once the program is established, the university will reassess resources and student demand and consider increasing enrollment.

External Consultant's Report

The proposed program was reviewed at the academic and professional levels. Dr. Nick Street, Research Professor of Management Sciences at the University of Iowa, formally reviewed the proposal and provided the external consultant's report (Appendix D). Additionally, the proposal was circulated among industry professionals and academics in informatics and big data careers (p. 8). Appendix C provides feedback and letters of support from individuals employed at Google, Bank of America, AT&T Labs, Nielson, Emory University, New York University, the University of Texas at Austin, and National Tsing Hua University in Taiwan.

Dr. Nick Street, who previously served as a department chair and director of graduate studies at the University of Iowa, commented that the proposed program was "exemplary, covering all the necessary foundational work as well as incorporating some fairly novel components that really stand out" (Appendix D, p. 72). During his time as

[6] In 2014, UF hired four faculty members from Clemson University HCC program. Twelve students, who were previously doctoral students at Clemson, transferred to UF to complete their doctoral programs of study.

the department head, Dr. Street fielded numerous calls from industrial partners seeking students with big data analytic skills. He commented that although the field is growing and demand for individuals with big data analytic skills is high, it was difficult for one single department to provide the depth and breadth necessary, warranting interdisciplinary approaches. He also praised the program for the inclusion of ethics and cognitive bias training noting that current decision-making is automated and that the next generation of decision-making systems should consider the societal impacts of their work (Appendix D, p. 73).

In the external consultant's report, a few concerns were raised. One concern was the number of required courses and a lack of flexibility in the curriculum. Since students were taking fourteen credits in the first two years and serving as graduate research assistants, there would be limited time for additional research. Also, because of the comprehensive nature of the curriculum, the number of required courses left little room in the curriculum to take courses in application areas (e.g., healthcare). Lastly, Dr. Street encouraged the program to consider an interdepartmental agreement for student support.

In response to these suggestions, adjustments were made to the proposed program. Since students may enter the program with a bachelor's degree, the program believes that the required graduate courses are essential in preparing students for the dissertation. However, the program made an adjustment for students entering the program with a master's degree. For these students, up to 12 credit hours of coursework may be transferred, providing that the coursework is equivalent to the required courses in the program (p. 7). This adjustment gives master's students some flexibility to take courses in areas of expertise. Additionally, the program reduced the number of dissertation hours from 24 to 21 while increasing elective credits from seven to ten. This adjustment gives all students the opportunity to take another course in a specialty area. In regards to additional student support, the program will have joint research seminars on a biweekly basis (p. 6).

The proposal also received favorable feedback from leaders in the industry and academia. Several commented on the interdisciplinary nature of the curriculum calling it "the best of all worlds" (Appendix C, p. 63) and forward-thinking (Appendix C, p. 62). All made note of the need for a doctoral program in this area. Specifically, Dr. Valliappa Lakshmanan, Tech Lead for Google Cloud's Big Data and Machine Learning Professional Services, stated, "while we at Google, Microsoft, Amazon, Nvidia etc. can build the frameworks and tools that enable large-scale data processing and machine learning, it is academia that has to build a workforce that is capable of applying these techniques in different domains" (pp. 59-60). Dr. Ramnath K. Chellappa, Dean of the Master of Science in Business Analytics Program at Emory University noted the challenges of finding "faculty who have a command over a wide variety of data analytics perspectives" (Appendix C, p. 65) and that graduates of this program would help fill this gap. Overall, all eight individuals provided support for the program and suggestions which were incorporated by the university.

Summary

The University of South Florida is proposing to develop a Ph.D. of Informatics and Big Data Analytics program. Due to its interdisciplinary nature, this program will be the first doctoral program of its kind in the SUS, but the second program in CIP 11.0104. The purpose of this program is to train students in the technical and human aspects of data analytics through a comprehensive curriculum addressing computational science, mathematics, decision-making, and ethics. The proposed program requires a minimum of 72 credit hours beyond the bachelor's degree and will be offered at the University of South Florida's Tampa campus beginning fall of 2020.

The program addresses the growing workforce demand for experts in big data analytics through producing graduates with applied experience in data analytics as well as academics. The proposal documents both a strong workforce and student demand for the program. Independent analysis by board staff supports the need for graduates in this field. Lastly, the proposal received several favorable letters of support from industry individuals and academics.

C. Assessment of the University Review Process in accordance with BOG Regulation 8.011:

Due to the system of stair step accountability set in place by the Board of Governors in Regulation 8.011, it is now incumbent upon University Board of Trustees to verify that all doctoral programs coming before the Board of Governors have met the requirements of the regulation. The following is an assessment of the university review process to ensure that all criteria set forth have been considered by the university prior to submission to the Board of Governors office.

ACCOUNTABILITY
Check 'yes' or 'no' box, and make comments beneath criterion as appropriate.

1. *Overall –* *The proposal is in the correct format, includes all necessary signatures, and contains complete and accurate tables for enrollment projections, faculty effort, and the proposed budget.*

YES NO

☒ ☐ **The proposal has been approved by the university board of trustees and includes all required signatures.**

The proposed program was approved by the University of South Florida's Board of Trustees on June 6, 2019.

☒ ☐ **The university has provided a proposal written in the standard SUS format which addresses new academic program approval criteria outlined in BOG Regulation 8.011.**

The new academic program proposal was written in the standard SUS format and in accordance with the criteria set forth in Board Regulation 8.011.

☒ ☐ **The pre-proposal was reviewed by the Council of Academic Vice Presidents (CAVP) workgroup and any concerns identified by the group have been listed and addressed in the proposal.**

The program's pre-proposal was presented to the Council of Academic Vice Presidents (CAVP) on February 6, 2018. There were no concerns raised.

☒ ☐ **The university has provided data that supports the need for an additional program in the State University System as well as letters of support or concern from the provosts of other state universities with substantially similar programs.**

The proposed degree program will be the second doctoral program in the SUS under CIP 11.0104. The University of Florida presently has a doctoral program in Human-Centered Computation in CIP 11.0104. The University of South Florida did consult with the University of Florida and found the two programs to be distinct (p. 18). There is one other Doctorate of Big Data Analytics program in the SUS at the University of Central Florida; however, the proposed program does not duplicate UCF's program. The interdisciplinary nature of the proposed program makes this program unique.

☒ ☐ **The university has provided complete and accurate projected enrollment, faculty effort, and budget tables that are in alignment with each other.**

Appendix A contains four tables that provide an overview of headcount projections, faculty effort, and the program budget.

☒ ☐ **The university has included a statement in the proposal signed by the equity officer as to how this proposal will meet the goals of the university's equity accountability plan.**

The University of South Florida's Equal Opportunity Officer reviewed and signed the proposal on April 22, 2019.

☒ ☐ **The program does not substantially duplicate programs at FAMU or FIU or, if it does, evidence was provided that consultations have occurred with the affected university on the impact of the new program on existing programs.**

The proposed program does not duplicate programs at FAMU or FIU.

2. Budget – *The proposal presents a complete and realistic budget for the program consistent with university and BOG policy, and shows that any redirection of funding will not have an unjustified negative impact on other needed programs.*

YES NO

☒ ☐ **The University Board of Trustees has approved the most recent budget for this proposal.**

The current budget was approved by the University of South Florida's Board of Trustees on June 6, 2019.

☒ ☐ **The university has reviewed the budget for the program to ensure that it is complete and reasonable, and the budget appears in alignment with expenditures by similar programs at other SUS institutions.**

The projected E&G cost per FTE in year one is $48,933 and in year five is $16,726. According to the 2017-2018 expenditure analysis report, the projected costs for the program in year one is above the system average of $17,651.76 for CIP 11, but will decrease to below the system average by year five.

☐ ☒ **The proposal indicates that the program will follow the cost-recovery or market-rate funding models. If so, details and timelines for getting approvals for these funding models are included in the proposal.**

The program will charge the approved graduate tuition rates for the university; however, there are some differences in the approved tuitions across colleges. Students enrolled in the program will be taking courses in the Muma College of Business and the College of Engineering, which, as high demand programs, charge programmatic tuition rates. Students in the program will pay higher tuition rates for the courses taught in those colleges and will pay the regular graduate tuition for courses taught in the Colleges of Arts and Sciences and Public Health. The Doctoral Program Committee will assure that students are aware of the differential costs prior to their initial registration.

☒ ☐ **In the event that resources within the institution are redirected to support the new program, the university has identified this redirection and determined that it will not have a negative impact on undergraduate education, or the university has provided a reasonable explanation for any impact of this redirection.**

The proposal indicates that the implementation of the Ph.D. in Informatics and Big Data Analytics will have minimal impact on existing courses and programs at the university. The curriculum is comprised of existing courses taught by eight existing faculty members, thus it is using existing resources (p. 21). The university seeks to enroll only four students in year one and five

more students each consecutive fall. The low headcount should not have a negative impact on course availability for existing students. Lastly, the Muma College of Business will utilize auxiliary funds from the Center for Analytics and Creativity and Doctorate of Business Administration program to provide three graduate research assistantships (p. 21). It is possible that the Department of Computer Science and Engineering, which has recently experienced program growth, may offer teaching assistantships.

READINESS

Check 'yes' or 'no' box, and make comments beneath criterion as appropriate.

3. Program Quality *– The proposal provides evidence that the university planning activities have been sufficient and responses to any recommendations to program reviews or accreditation activities in the discipline pertinent to the proposed program have been addressed.*

YES NO

☒ ☐ **The university has followed a collaborative planning process for the proposed program in accordance with policies and procedures adopted by the University Board of Trustees.**

The proposal describes a collaborative planning process involving faculty, administrators, and graduate council (pp. 27-28).

☒ ☐ **An external consultant has reviewed the proposal and supports the department's capability of successfully implementing this new program.**

Dr. Nick Street, Research Professor of Management Sciences at the University of Iowa, formally reviewed the proposal and provided the external consultant's report (Appendix D). Additionally, Dr. Street conducted a campus visit on March 18 and met with multiple stakeholders. Dr. Street provided strong support for the program's interdisciplinary curriculum and the administrative structure noting that housing the program in the Muma College of Business was crucial to ensuring the program had the necessary administrative support (p. 73). Dr. Street did provide some constructive feedback regarding the number of credits required in the first year and lack of flexibility of the program. The proposal documents adjustments that were made to the program as a result of the feedback (pp. 6-7).

Additionally, the proposal was circulated among eight industry professionals and academics. All eight individuals provided letters of support for the program (Appendix C).

☒ ☐ **The university has found the level of progress that the department has made in implementing the recommendations from program reviews or accreditation activities in the discipline pertinent to the proposed program to be satisfactory.**

Presently there are no organizations that accredit doctoral programs in informatics and big data analytics. Per the proposal, the Muma College of Business had an Association to Advance Collegiate Schools of Business (AACSB) visit in 2018 (p. 28). The college was reaccredited with no actionable recommendations. AACSB accredits the College of Business as a whole. While there presently isn't a specific accreditation for this program, the college will conduct annual internal reviews assessing assurance of learning outcomes, research productivity, grant funding, student success, student placement, and business and community engagement (p. 28).

☒ ☐ **The university has analyzed the feasibility of providing all or a portion of the proposed program through distance learning.**

According to the proposal, all courses will be delivered face-to-face on the University of South Florida's Tampa campus.

☐ ☒ **If necessary, the university has made allowances for licensure and legislative approval to be obtained in a timely manner.**

Not applicable.

4. Curriculum *- The proposal provides evidence that the university has evaluated the proposed curriculum and found that it describes an appropriate and sequenced course of study, and that the university has evaluated the appropriateness of specialized accreditation for the program.*

YES NO

☒ ☐ **The university has reviewed the curriculum and found that the course of study presented is appropriate to meet specific learning outcomes and industry driven competencies discussed in the proposal.**

The program proposal identifies specific program learning outcomes in the areas of knowledge, scholarship, and applied research (p. 29). The program requires the completion of a minimum of 72 credit hours including 41-42 credit hours of coursework, 10 credit hours of independent study/practicum and electives, and 21 credit hours of dissertation work. Students must also complete their qualifying exam, which includes a research paper based off the practicum experience, prior to seeking doctoral candidacy (p. 29). The program is designed to be completed in three years.

All students entering the program must complete two core courses: Introduction to Theory of Algorithms and Introduction to Research Methods.

The remainder of the coursework is divided into three perspectives: human, computational, and statistical. An outline of the curriculum and possible courses for each perspective are listed on pp. 31-32 of the proposal.

☐ ☒ **The university anticipates seeking accreditation for the proposed doctoral program, or provides a reasonable explanation as to why accreditation is not being sought.**

Per the proposal, there are currently no organizations that accredit doctoral programs in informatics and big data analytics (p. 28); however, the Muma College of Business was reaccredited by the Association to Advance Collegiate Schools of Business in 2018.

5. ***Faculty –*** The proposal provides evidence that the university is prepared to ensure a critical mass of faculty will be available to initiate the program based on estimated enrollments, and that faculty in the aggregate have the necessary experience and research activity to sustain a doctoral program.

YES NO

☒ ☐ **The university has reviewed the evidence provided and found that there is a critical mass of faculty available to initiate the program based on estimated enrollments.**

According to Appendix A, Table 4, eight current faculty members will participate in the doctoral program. The faculty includes five professors and two associate professors. The faculty are from various disciplines including mathematics, engineering, psychology, and business (p. 56). No new faculty are anticipated.

☒ ☐ **The university has reviewed the evidence provided and found that the faculty in aggregate has the necessary experience and research activity to sustain the program.**

Appendix E contains the abbreviated curriculum vitaes for all eight faculty members. As a whole, the faculty have strong publication and research records.

☒ ☐ **The university has reviewed the evidence provided and found the academic unit(s) associated with this new degree to be productive in teaching, research, and service.**

As this is an interdisciplinary program housed in the Muma College of Business, the proposal provides headcounts and degrees awarded data for the University of South Florida and the college itself (pp. 40-42). In the past five years, The Muma College of Business has graduated 89 doctoral students.

☐ ☒ **If appropriate, the university has committed to hiring additional faculty in later years, based on estimated enrollments.**

According to the proposal and Appendix A, no new program faculty are anticipated.

6. Resources *– The proposal provides evidence that the university has ensured the available library volumes and serials; classroom, teaching laboratory, research laboratory, office space, equipment, clinical and internship sites, fellowships, scholarships, and graduate assistantships will be sufficient to initiate the program, and that if applicable, funding has been secured to make more resources available as students proceed through the program.*

YES NO

☒ ☐ **The university has provided a signed statement from the Library Director verifying that the library volumes and serials available are sufficient to initiate the program.**

Per the proposal, no additional databases, journals, or books are needed to support the implementation of the program. The Library Director signed the proposal on April 16, 2019 (Appendix B, p. 57).

☒ ☐ **The university has ensured that the physical space necessary for the proposed program, including classrooms, laboratories and office space, is sufficient to initiate the program.**

According to the proposal, students will be absorbed into already existing courses and office space, so additional facilities, classrooms, or offices are not needed at this time (p. 52).

☒ ☐ **The university has ensured that necessary equipment is available to initiate the program.**

Per the proposal, no additional or specialized equipment is needed for the proposed program.

☒ ☐ **The university has ensured that fellowships, scholarships, and graduate assistantships are sufficient to initiate the program.**

The Muma College of Business will regularly support three students with assistantships provided through auxiliary funds. It is expected that there will be grant-supported assistantships as the program faculty are active scholars in the field. Additionally, there may be teaching assistantship opportunities for courses in big data; however, these teaching assistantships are currently not reflected in the budget (Appendix A, Table 2).

☒ ☐ **If applicable, the university has ensured that the department has arranged a suitable number of clinical and internship sites.**

Currently, there are sites for internships and practicum experiences with USF's corporate partners. Additionally, the letters of support from industry individuals (Appendix C) note interest in providing student internships (p. 52).