2.5

Institutional Effectiveness

The institution engages in ongoing, integrated, and institution-wide research-based planning and evaluation processes that (1) incorporate a systematic review of institutional mission, goals, and outcomes; (2) result in continuing improvement in institutional quality; and (3) demonstrate the institution is effectively accomplishing its mission.

Judgment

☑ Compliance ☐ Partial Compliance ☐ Non-Compliance ☐ Not Applicable

Narrative

Tennessee Technological University (TTU) engages in ongoing, integrated, institution-wide, research-based planning and evaluation processes that incorporate a systematic review of the institution's mission, goals, and outcomes. These processes that take place at multiple levels across the University, enable TTU to accomplish its mission effectively, and continuously improve its institutional quality [1]. The following narrative describes in detail TTU's planning, reporting, budgeting, and evaluation processes and systems and provides evidence of how they effectively support its mission and result in the continuous improvement of the University. The narrative is organized into three sections: (1) planning and its compliance components, (2) evaluation and its compliance components, and (3) the effects of planning and evaluation and their compliance components.

Section I: Planning

The planning process at TTU includes a systematic review of institutional mission, goals, and outcomes. The mission of TTU serves as the guiding focus for all the efforts to achieve institutional effectiveness. The mission statement was last revised in October 2005 and approved by the Tennessee Board of Regents (TBR) on December 2, 2005, with the Strategic Plan. It was reviewed and approved by the TBR on March 25, 2011, for the 2011-2015 planning cycle, but no changes were made [1]. The mission statement was reviewed by the Strategic Planning Committee before being submitted to TBR. The mission statement is reviewed during each five-year strategic planning cycle. It was reviewed as part of the Flight Plan, i.e., the current strategic plan, but no changes were made at that time.

The current mission states, "Tennessee Technological University's mission as the state's only technological university is to provide leadership and outstanding programs in engineering, the sciences, and related areas that benefit the people of Tennessee and the nation. The University also provides strong programs in the arts and sciences, business, education, agriculture and human ecology, nursing, music, art and interdisciplinary studies. Tennessee Tech serves students from throughout the state, nation, and many other countries, but it retains a special commitment to enrich the lives of people and communities in the Upper Cumberland region of Tennessee. The University is committed to the life-long success of students in its undergraduate, master's, specialist, and doctoral degree granting programs through high-quality instruction and learning experiences. The University is engaged in scholarly activity, especially basic and applied research, creative endeavors, and public service, with special emphasis on community and economic development. The University supports student participation in a broad array of extracurricular activities as an integral component of its commitment to student life and success. The University's three interdisciplinary Accomplished Centers of Excellence in Energy Systems Research, Manufacturing, and Water Resources, and Chairs of Excellence in Business Administration strengthen the instructional, research, and service mission of the University. The University is as supportive of women as of men and as supportive of those in the minority as of those in the majority. The University provides educational opportunities to all eligible persons without regard to age, gender, ethnicity, race, religion, national origin, disability, or sexual orientation. The institution is committed to

an inclusive and diverse campus that enriches the educational experience, promotes personal growth and a healthy society, prepares students for success in a global economy, and enhances America's economic competitiveness" [1].

At TTU, the objective of strategic planning is to guide the University in critical decisions, provide common goals for campus units and employees, and define action plans to help the University strive toward its vision. The planning process is broadly participative and represents the University's commitment to shared governance [2] [3].

Since 2005, strategic planning has gone through two five-year cycles. The plan was updated in 2010 and approved by TBR on March 25, 2011 [4]. The plan aims to define policy, set directions, and establish priorities. The plan was informed by inputs from the campus community and SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis [5]. The key priorities of the plan, i.e., leadership, access to learning, quality, resourcefulness, and efficiency, were aligned with the then strategic plan of the TBR [6]. An overview of the plan and the strategic goals is given at [7]. A reporting structure provided the assessment and feedback on the progress made on the strategic goals [8].

During 2009-2010, the fiscal environment of planning became daunting as TTU had to adjust to the changes in state law affecting funding and outcomes for higher education, while facing the most drastic budget reductions in its history. A change with major transformative impact on public higher education in Tennessee was the Complete College Tennessee Act (CCTA), which was adopted by the State in 2010. The agenda of CCTA was comprehensive, involving changes in academic, fiscal, and administrative policies. It recognized the need to educate and train more Tennesseans at the post-secondary level in an environment of diminished fiscal support from the state. The two key policy instruments of CCTA are a new funding formula, which focuses on educational outcomes instead of enrollment, and a performance funding formula with a focus on quality assurance and the distinguishing characteristics of the institution in terms of its mission, programs, and student profiles [9].

For many years, TTU stood at or near the top in Tennessee Higher Education Commission (THEC) performance funding criteria, including enrollment growth and retention, among TBR universities. TTU's performance remains steady in these areas. However, with the implementation of the CCTA, the criteria now emphasize educational outcomes such as improving retention and graduation rates. State-level priorities also include workforce development and increased productivity. Accordingly, the priorities of TTU's strategic plan of 2011-2015 reflected the need to meet the resource challenges by emphasizing efficiency and cost savings in campus operations [10] [11].

Ongoing, research-based planning. In 2012, following the submission of the fifth-year interim Southern Association of Colleges and Schools Commission on Colleges (SACSCOC) report, a new President was appointed. Under his leadership, there was a new approach to strategic planning. In 2012, TTU launched a strategic plan called Flight Plan: Focused for the Future [12]. Following extensive research and data gathering, the planning and evaluation processes underwent major changes [13].

The transition to the new strategic plan, i.e., Flight Plan, and the linkages between its focus areas and the priorities of the prior strategic plan are captured in Figures 1 and 2.
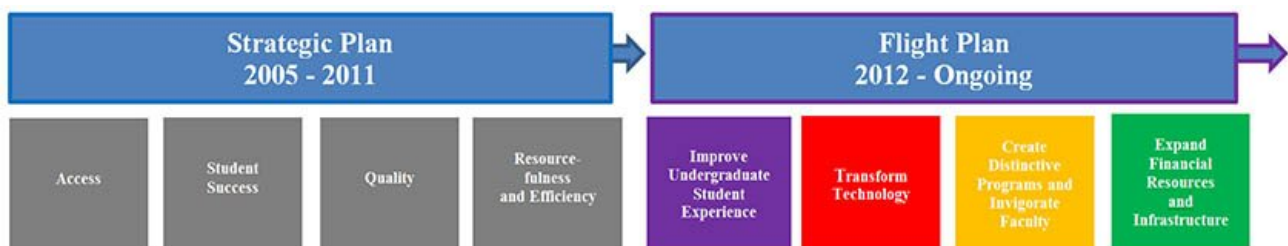
Figure 1. Ongoing strategic planning at TTU.

Legend

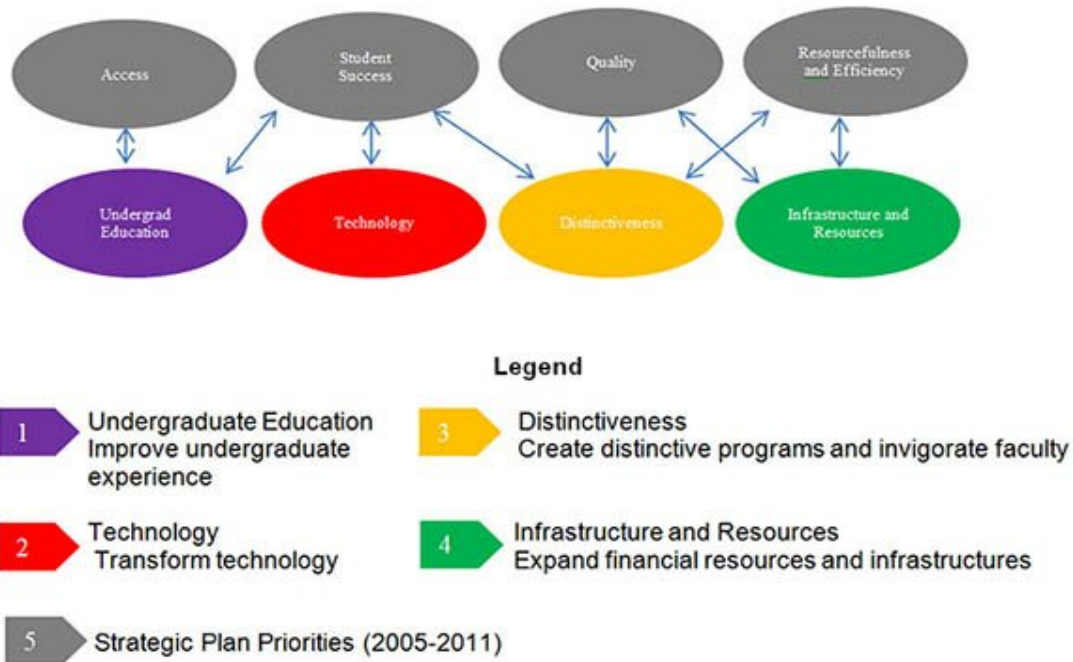| | Undergraduate Education Improve undergraduate experience | | Distinctiveness Create distinctive programs and invigorate faculty |

Figure 2. Strategic Plan — Flight Plan linkages.

The main objectives of Flight Plan are to [14]:

- Develop a process that engages stakeholders in the development of a long-term plan [15]
- Complete a fact-driven review of TTU's current state [16]
- Use data to compare TTU to selected peers (at state and national levels) [17] [18]
- Gather stakeholder perspectives through their engagement and interviews
- Identify the implications of external factors impacting TTU, including the CCTA
- Determine strategic directions to position the University for continued success in the future
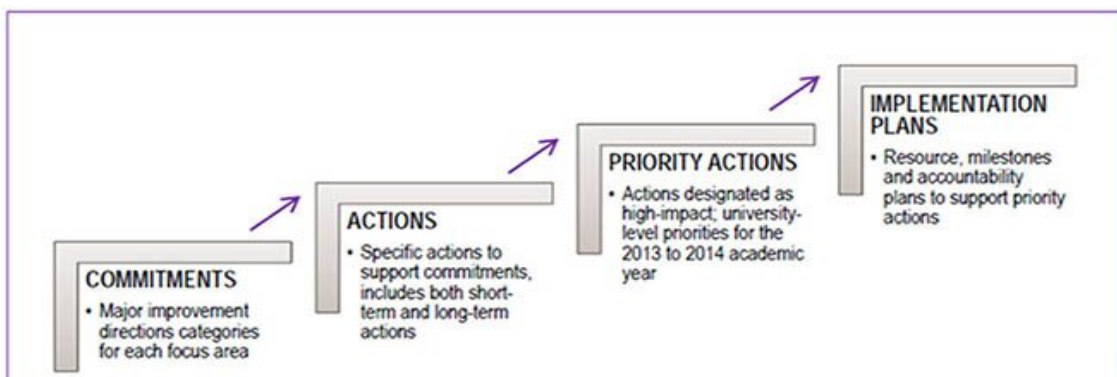- Establish a process to turn directions into actions (See Figure 3.)

Figure 3. Flight Plan process.

Faculty, staff, and students were engaged in the Flight Plan process through multiple focus groups and feedback points [15] [19].

The key features of the Flight Plan are: (a) four focus areas; (b) 12 action priorities, each tied to a focus area; and (c) 10 metrics for evaluating progress [14].

Flight Plan focus areas. The team of faculty, staff, and students identified the following four themes, which are called focus areas of the plan. These focus areas help determine the strategic directions for the University [20].

1. Improve the undergraduate student experience
2. Transform technology
3. Create distinctive programs and invigorate faculty
4. Expand financial resources and modernize infrastructure

Collectively, they aim to realize the institution's vision, "Tennessee Tech will be nationally recognized as a leading technological university in the South, providing academic, economic and cultural leadership in the region and producing practical, ready-to-work graduates from a broad range of academic disciplines prepared to compete in a technologically driven world" [1].

System-wide, integrated planning. The four focus areas are aligned with and address the goals of the CCTA legislation [9] [21] [22]. The Flight Plan, with its four focus areas, delineates TTU's course for meeting and exceeding the CCTA requirements. An improved undergraduate experience, enhanced technologies to support student needs, new and innovative programs coupled with a committed faculty, and increased non-state funding all fall in line with the Act (see Table 1).

Table 1. Flight Plan Focus Areas and CCTA Goals Linkages.

Focus Area: Improve Undergraduate Student Experience Linkage to CCTA goals:
5% increase over five years in 1st to 2nd year retention   2% increase in 2nd to 3rd year retention   5% increase in six-year graduation rate   - Funding formula rewards increase in educated graduates   - Performance Funding program incentive for increased educational quality   - Performance Funding program provides check/balance to funding formula   - Outcomes based   - Rewards productivity to further goals of public agenda   - Takes university mission into account by weighting factors   - Student learning   - Student retention and graduation   - Access/graduation for underserved subpopulations
Focus Area: Transform Technology **Linkage to CCTA goal:**
Enhanced technology supports all other efforts
Focus Area: Create Distinctive Programs and Invigorate Faculty **Linkage to CCTA goals:**
- Funding formula recognizes research activity that has regional application/relevance   - Performance Funding program incentive for increased educational quality   - Public higher education to become increasingly competitive on national/international scene   - University mission distinctiveness guides approval of new degree programs   - University mission distinctiveness guides research efforts
Focus Area: Expand Financial Resources and Modernize Infrastructure **Linkage to CCTA goal:**
Non-state funding increasingly necessary to fund new degree programs

Flight Plan priorities. Currently, there are 12 priorities of the Flight Plan, each of which is associated with one of the above focus areas (see Table 2). The Flight Plan allows for flexibility in these priorities, which may change over time [23].

Table 2. Flight Plan Focus Areas and Priorities.

Focus Area: Improve the Undergraduate Student Experience
1. Freshman Flight Path
2. Academic advising
3. High demand course capacity
Focus Area: Transform Technology
4. Technology service to students
5. Technology Infrastructure
Focus Area: Create Distinctive Programs and Invigorate Faculty
6. Undergraduate co-curricular program

6. Undergraduate co-curricular program
7. Multidisciplinary research innovation
8. New graduate programs
9. Technology in teaching

Focus Area: Expand Financial Resources and Modernize Infrastructure
10. Enrollment, tuition, and scholarships
11. Physical structure priorities
12. Efficiency and effectiveness

Flight Plan directions and priorities are in alignment with the University's mission (see Table 3).

Table 3. Flight Plan and Mission Alignment.

Mission Component: "Tennessee Technological University's mission as the state's only technological university is to provide leadership and outstanding programs in engineering, the sciences, and related areas that benefit the people of Tennessee and the nation. The University also provides strong programs in the arts and sciences, business, education, agriculture and human ecology, nursing, music, art and interdisciplinary studies. The University is engaged in scholarly activity, especially basic and applied research, creative endeavors, and public service, with special emphasis on community and economic development." **Flight Plan Priorities:** • Undergraduate co-curricular programs • Multidisciplinary research innovation • New graduate programs
Mission Component: "The University is committed to the life-long success of students in its undergraduate, master's, specialist, and doctoral degree granting programs through high-quality instruction and learning experiences." **Flight Plan Priorities:** • Freshman flight path • Academic Advising • High demand course capacity • Technology in teaching
Mission Component: Tennessee Tech serves students from throughout the state, nation, and many other countries, but it retains a special commitment to enrich the lives of people and communities in the Upper Cumberland region of Tennessee." **Flight Plan Priorities:** • Technology service to students • Technology infrastructure • Enrollment, tuition and scholarships • Physical structure priorities • Efficiency and effectiveness

Campus Master Plan. The ongoing master planning process for the TTU campus complements the strategic planning process. The 2004 master plan was updated in 2010 and 2014. The refinements for the 2014 plan received input from representatives of various areas of the campus, TBR, designers of the upcoming projects, and a transportation consultant. In addition to updating many previous plan concepts, the 2014 plan addresses three major items for transforming the campus: the integrated

science building, the intramurals building, and greening of the campus. Ten-, twenty-, and thirty-year visions for these transformations are included in the plan [24].

Strategic planning and budgeting. As a unit of the TBR, TTU has a budget planning and administration process that is governed by Board of Regents' policy. The strategic plan provides the context for budgeting and resource allocation.

Strategic planning and budgeting were combined into one committee with the new planning cycle beginning in 2010. Colleges/units/departments used the strategic planning template to propose actions that would accomplish the strategic objectives identified during the strategic planning process. Many of the action items required resource allocations, and these were proposed along with the action items. The Strategic Planning and Budgeting Committee reviewed action items in the spring and fall in preparation for the Proposed Budget (July budget) and the Revised Budget (October budget). Action items approved by the Committee were funded [25].

In 2012, with the appointment of the new President, the University undertook a process to identify the "gap" between the University standing on selected measures of success compared with two selected peer groups – national peers and Tennessee peers. The process became the basis for a new strategic plan – the Flight Plan.

In Spring 2013, the University was notified by TBR staff that future requests for increases in maintenance (tuition) fees would be considered by the Board only if the request was linked to strategic actions designed to support student success/graduation as envisioned by the CCTA. Action items were submitted by each of the four Flight Plan focus area committees, and these were used by the University to develop a proposed maintenance fee increase for consideration and approval by the TBR in both the spring of 2013 and the spring of 2014. Both requests were approved by the Board and resulting resources budgeted as proposed through the action plans.

In Fall 2014, the University reactivated its Budget Advisory Committee. The Budget Advisory Committee works in conjunction with the focus area committees to review budget requests from colleges/units/departments and to make recommendations to the President for resource allocation to accomplish the strategic priorities of the University.

The Budget Advisory Committee is charged with the following:

The Budget Advisory Committee is an advisory body to the President. The Committee acquires knowledge and understanding of the University and TBR budgeting process and reviews budget requests and makes recommendations, within the framework of the University's Strategic Plan, on the priorities for funding should funding dollars be available. The Committee also recommends to the President changes in the budget processes, functional level funding allocations, and carry-forward budgeting guidelines as appropriate. The Committee facilitates transparent and informative communication of the University's operating budget.

The membership of the Committee is given in [26]. The minutes of the October 1, 2014, meeting of the Committee and the attachment to the minutes are included in the evidentiary documents below [27].

Strategic planning at Tennessee Higher Education Commission (THEC) and TTU, and budgeting at TTU are integrated through the following process. The various units on campus submit budget requests that are linked to the Flight Plan. These requests are incorporated in the maintenance fee proposal which in turn is linked to the State of Tennessee Complete College Tennessee Act (CCTA), i.e., THEC's strategic plan for higher education. Two examples illustrate these linkages. Evidentiary document [28] shows budget requests submitted by two campus units for the July 2015 to June 2016 FY and their links to Flight Plan priorities. The first page of [28] – request from University Development – is shown on the maintenance fee request [29] under Marketing and Fundraising; the second page – request from University Police – is shown on the maintenance fee request under Campus Police.

Investments in institutional effectiveness and continuous improvements. Internally, the

President determines budget allocation priorities on the advice of the Budget Advisory Committee, basing allocations and decisions according to the strategic priorities in the Flight Plan that have been approved for the University [27].

The investments needed to close the gap in the focus areas of the Flight Plan have been identified. They are organized into two categories [30].

Near-term investments. Resource estimates and requests to fund priority action plans during the 2013-14 year. Funding was incorporated in the 2013-14 plan.

Longer-term investments. Resource estimates and requests to fund priority action plans during the 2014-2015 year and beyond.

The following are some examples of budgeting linked to the Fight Plan for institutional effectiveness and continuous improvements [30]:

Focus area – improve undergraduate student experience.

1. Freshman Flight Path $75,000 (for hiring director of retention, purchasing attendance system)
2. Academic advising $785,000 (for academic advisor positions)
3. Relieving high demand courses $1,045,000 (for hiring new faculty)
4. Degree Works for academic advising and audit in real time $250,000 [31]
5. Student Success Collaborative for predicting student success $75,000 [32]

Focus area – transform technology.

6. IT Infrastructure and Innovation $500,000 (to augment the IT staff at TTU)

Focus area – create distinctive programs and invigorate faculty.

7. Co-curricular undergraduate programs. The initial phase plan calls for nearly $300,000 to add resources to support
    undergraduate research.

Focus area – expand financial resources and modernize infrastructure.

8. Event Management System (EMS) for scheduling classes and events $131,143 (since 2012) [33]

Additionally, during the academic year 2014-2015, 11 grants, totaling $47,530, were awarded to 4 faculty members, 6 staff members, and 1 student under the Provost's Micro-Grant Program for Student Success [34] [35c]. This program is designed to improve students' retention, persistence, and graduation rates by implementing new and innovative strategies that would enhance TTU students' abilities to graduate within a four-year period. Faculty, staff, and students can submit proposals. This program is aligned with the Fight Plan focus area of improving undergraduate student experience.

Section II: Evaluation

The plans and programs at TTU undergo ongoing, research-based, and systematic evaluations. The process and the infrastructure for such evaluations are described below.

The Flight Plan incorporates a structure and process for implementation, assessment, communication, and accountability. These important requirements for the effectiveness of the plan are shown in Figure 4.
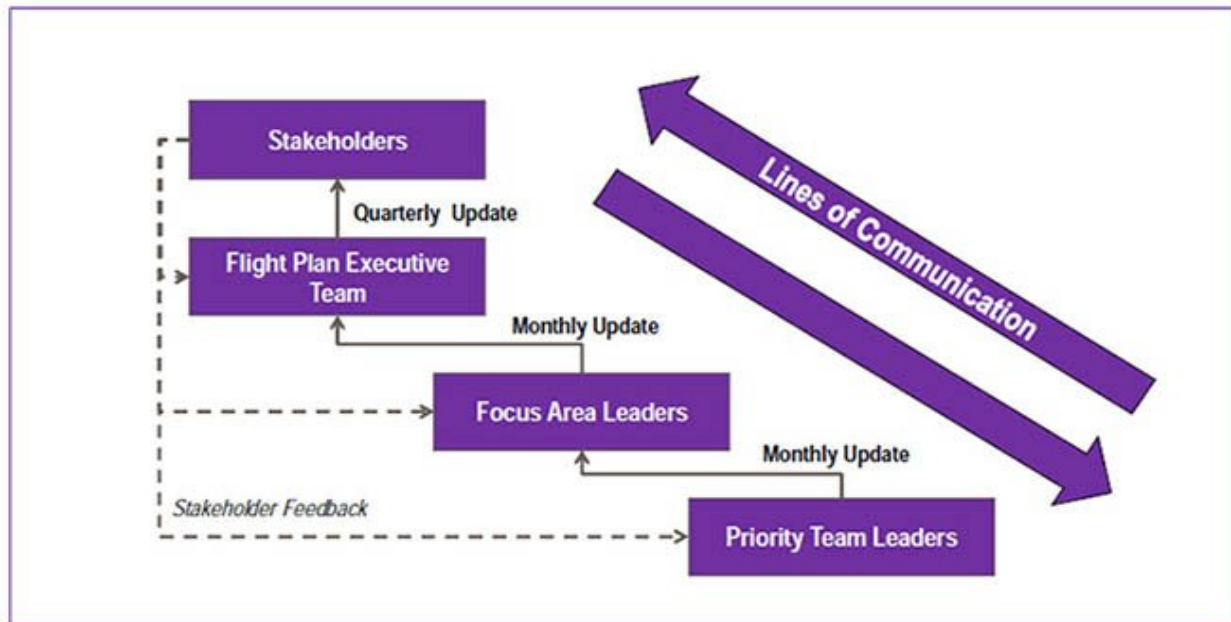
Figure 4. Flight Plan implementation, communication, and accountability.

There is an implementation and accountability plan for each Flight Plan focus area and priority [36].

Each focus area is headed by a cross-functional executive leadership team consisting of a member of TTU's senior leadership, a faculty member, and an administrator. Implementation team leaders for each priority area provide feedback and monthly updates and report the status of the project to the Flight Plan executive leadership team. The President and the Provost share progress updates with the campus community on a regular basis through blogs, the Flight Plan website, meetings, and open forums [20] [35a] [35b] [35c]. Figure 4 captures this evaluation, feedback, and communication process. The implementation plan for each priority is informed by context for action, research on higher education trends, and peer context [37].

The success of implementation is measured by operational metrics specific to the priority and by selected Flight Plan metrics. The complete set of Flight Plan metrics is given below in Table 4.

Metrics for evaluating the Flight Plan. The Flight Plan overall, is evaluated by metrics such as ACT scores, number of bachelor's degrees conferred, retention rates (first to second year and second to third year), and graduation rates. These are also the performance measures used by the CCTA [38].

Ten metrics have been set to enable the evaluation of the progress against Flight Plan objectives (see Table 4). These metrics address outcomes in the four focus areas. The metrics allow direct comparison with national comparative peer schools and Tennessee peer schools of TTU. They enable research-based gap analysis that can be used for making improvements [16].

Table 4. Flight Plan Metrics.

Undergraduate
1. ACT score range
2. FTE enrollment
3. Bachelor's degrees
4. Retention rate
5. Six-year graduation rate
Graduate and Research
6. Doctoral Degrees
7. Master's degrees
8. Research expenditures per faculty
Financial
9. Operating expenditures per student
10. Endowment per student

The Flight Plan was reviewed and its progress evaluated in meetings called by the Vice President for Planning and Finance. The leaders of the focus areas provided updates, and the academic deans shared their units' role and contributions to the goals of the Flight Plan. Recent data on Flight Plan metrics (see Table 9) was reviewed, and next steps were discussed [39][40][41][42].

 Research, review, and reporting infrastructure supporting evaluation processes. The Office of Institutional Research (OIR), the Office of the Provost, the Office of University Assessment, and the University standing committees provide institution-wide infrastructure and support for the evaluation processes.

The OIR is a major component of the evaluation infrastructure at TTU. It is involved in ongoing data collection, analysis, and dissemination of information on all of the Flight Plan metrics. The progress made on these metrics is made available on a regular basis in reports to the senior leadership team of the University and to the leaders in the academic, administrative, and support units. The OIR plays a key role in supporting the planning and evaluation processes at TTU by the information and analyses it provides [43].

The Office of the Provost implements program assessments according to the THEC performance funding and SACSCOC guidelines. The data collected are used for evaluating academic programs and TTU's annual performance reporting to the TBR. The details about these program assessments are given in the section on effects.

TTU has ongoing, institution-wide processes for assessing and improving student learning outcomes in academic programs, operational outcomes in the administrative and support units, and in research and public and community service activities [44]. They are described in detail in the narratives for comprehensive standards 3.3.1.1 – 3.3.1.5. Institutional Effectiveness (IE) reports for academic programs, administrative and support services, and research and service areas are collected annually and continually monitored by the Office of the Provost and the Office of University Assessment. The Office of University Assessment is headed by the Director of Assessment. There is budgetary support for this position. A software (Campus Labs) with planning tools for submitting reports efficiently and consistently was purchased and was implemented for collecting IE reports in the 2014-2015 academic year. Modeled on the report guide and template, training, and reporting from 2011-2014, the Campus Labs planning module enabled TTU in 2014-2015 to utilize a uniform and consistent process for reporting and reviewing institutional effectiveness for the entire campus.

TTU has a structure of standing committees with institution-wide representation from faculty, staff, administrators, and students for practicing shared governance, collaborative decision-making, and accountability. The description of these committees and their responsibilities is available at [45].

These committees, which include the Strategic Planning and Assessment Committee and the Budget Advisory Committee, play an important role in reviewing and monitoring the progress of various initiatives and plans that affect institutional effectiveness and making recommendations to the senior leadership of TTU.

Unit level planning and evaluation. Planning and evaluation at TTU occur at multiple organizational levels. The unit-level strategic plans are aligned with the Flight Plan. These plans guide resource

allocation and actions at the unit levels. The following are examples of these processes:

1. The strategic goals of the Office of Research and Economic Development (ORED) are to develop and encourage activities to increase extramural funding, develop and encourage activities to enhance innovation, and identify activities with the most potential for improving the economic environment within the entire region. The goals match TTU's Flight Plan to enhance research, innovation, and contributions to community and economic development of the Upper Cumberland region. They are aligned with TTU's mission "to enrich the lives of people and communities in the Upper Cumberland region of Tennessee . . . . The University is engaged in scholarly activity, especially basic and applied research, creative endeavors, and public service, with special emphasis on community and economic development."

   The goals and objectives were developed in collaboration with the University Research Advisory Committee and the deans of the colleges. Data for each objective were analyzed and presented to the deans and discussed at the University Research Advisory Committee, which meets five times a year. The data and results are presented in the annual report, discussed with the University Research Advisory Committee, disseminated to the higher administration, and faculty, and posted on the Office of Research website [46]. The results are used for making continuous improvements. For instance, from the results of satisfaction surveys, the ORED identified a need to provide more training to faculty on proposal development and preparation, add one staff member to assist faculty and staff with the development of the proposal budgets, and add another staff member to assist faculty with writing proposals.

2. The Center for Manufacturing Research (CMR) developed its strategic plan utilizing manufacturing road maps for the 21st century and feedback from Center faculty and a survey of existing laboratory capabilities and infrastructure. The plan has identified three focus areas of expertise and investment: materials and devices for cost-effective energy storage/conversion/efficiency; wireless communications, sensing, and machine learning; and in situ and non-invasive sensing, modeling, and control of systems and processes. Moreover, the plan is aligned with three of the six strategic research thrust areas of the College of Engineering: advanced manufacturing, energy storage and conversion, and networking and sensing [47].

3. The strategic plan of the Center for the Management, Utilization, and Protection of Water Resources includes the goal to increase externally funded research, which addresses the diverse water-related problems in Tennessee, the nation and the world. Toward this goal, the Center strives to increase external funding to $3 (including indirect costs) per dollar of state appropriation. Strategic focus areas have been established by the Center faculty and associates. These focus areas guide the investment of the Center's funds. The goal is assessed by the external funds received in the fiscal year. Trends are analyzed and corrective actions are taken to achieve the goal. The Center works with the university administration to keep Tennessee's congressional delegation informed about research findings and new emerging areas of research [48].

4. In the Information Technology Services (ITS) area, there was a need for a comprehensive strategic plan which provides a structure for guiding priorities, resources, decision-making, and which is aligned with the strategic directions of the University. To address that need, an information technology (IT) strategic plan to strengthen technology capabilities in infrastructure and services was developed [49] by a core team of faculty, students, staff, and leadership from TTU working with IT team leadership within the context of the University's Flight Plan initiatives.

5. The College of Engineering has developed a strategic plan that articulates its vision of graduating 21st century renaissance engineers. The plan priorities drive project selection and funding for implementing the plan [50] [51].

6. The College of Business uses a systematic process which includes SWOT analysis, to develop its strategic plan. The strategic plan has four focus areas: improving and enriching student experience, encouraging scholarship and innovation, effectively utilizing technology, and

expanding and effectively using financial resources which are aligned with the Flight Plan focus areas [52].

To deploy Flight Plan university-wide and to ensure that unit level plans, outcomes, and metrics are integrated with the Flight Plan priorities, starting in 2014, the annual reports to the President of the academic and administrative units should show their integration with at least one or more priorities [53]. Likewise, the unit has to indicate how the metrics it uses support and are integrated with Flight Plan metrics. Tables 5 and 6 provide examples of such integration in the case of College of Business (COB) [54]. Similarly, starting in 2015, in the annual Institutional Effectiveness (IE) reports for academic programs, administrative units, and student support units, the linkages between program goals, improvements, and modifications made (based on assessments) and Flight Plan priorities must be indicated. The annual IE reports are available at [55].

Table 5. Integration of Unit Level Plans and Outcomes with the Fight Plan Priorities.

Flight Plan Priorities	Unit Level Plans and Outcomes (**Example: College of Business, 2014**)
1.Freshman flight path	Because many students inquire about starting business, one section of the college's UBUS 1020 was designated for students interested in entrepreneurship
2.Academic Advising	A Business Showcase, held March 25, 2014, was an on-campus recruitment and promotion effort to publicize the academic and professional opportunities of the College of Business. Thirty students registered and walk-thru the event. It is estimated that seven students changed their major to business as a result of this effort.
3.High demand course capacity	
4.Technology service to students	In 2014, the Business Media Center (now called iCUBE) expanded to include the Hybrid Immersive Visualization Environment (H.I.V.E.). It will provide a learning environment that is vastly different from the traditional classroom. MBA Studies is currently undergoing a comprehensive ADA compliance review of all online courses.
5.Technology infrastructure	The College of Business Board of Trustees continued the "Keeping the Promise" Renovation of Johnson Hall campaign.
6.Undergraduate co-curricular programs	Conducted a "Business Opportunity Competition" in Spring 2014 in collaboration with the Design Competition in the Department of Chemical Engineering.
7.Multidisciplinary research innovation	Bio-fuels (pyrolysis) project applied for to NSF (National Science Foundation with Primary Investigator from Chemical Engineering, Joe Biernacki, Ann Davis (Business) *et al*., $404,713 (funded).
8.New graduate programs	In Spring 2014, the Department of Accounting submitted a Letter of Intent to launch a new Master of Accountancy degree at TTU in Fall 2016.
9.Technology in Teaching	Renovation of the Charlie Hawkins Lobby, Gary Pickett Computer lab, and the Whewon Cho Classroom was completed. The new classrooms provide state-of-the-art technological teaching tools for our professors. Sean Alley introduced Top Hat clickerless classroom response system

	in ECON2010 and ECON2020.
10.Enrollment, tuition and scholarships	The College of Business Board of Trustees increased its scholarship budget to almost $200,000 for the upcoming academic year.
11.Physical structure priorities	Renovation of the Charlie Hawkins Lobby, Gary Pickett Computer lab, and the Whewon Cho Classroom was completed.
12.Efficiency and effectiveness	MBA Studies set efficiency goals of returning all admission evaluations within two business days, and responding to all student inquiries and information requests within one business day.

Table 6. Integration of Flight Plan and Unit Level Metrics.

Flight Plan Metrics	Unit Level Metrics (Example: College of Business – COB, 2014)
1.ACT score range	COB freshman ACT range
2.FTE enrollment	COB FTE enrollment (undergraduate and graduate)
3.Bachelor's degrees	Undergraduate degrees conferred in Business
4.Retention rate	COB Retention rates (Fall to Spring, Fall to Fall)
5.Six-year graduation rate	COB Six-year graduation rate
6.Doctoral degrees	Does not apply to COB
7.Master's degrees	MBA degrees conferred
8.Research expenditures per faculty	Does not apply to COB
9.Operating expenditures per student	COB Operating expenditures per student
10.Endowment per student	COB Endowment per student

Section III: Effects

Systematic reviews. TTU is accredited by the SACSCOC to award baccalaureate, master's, specialist and doctoral degrees. SACSCOC accreditation has a 10-year review cycle but as part of periodic review process, a five-year interim report was submitted in 2012. The feedback was used for making continuous improvements.

At the unit level, one of the indicators of the effectiveness of the academic programs at TTU is the accreditation they hold. These accreditations are awarded after rigorous evaluations of the programs by national or regional accrediting bodies. The programs undergo periodic and systematic reviews in order to maintain their accreditations.

Five of the six colleges of TTU currently hold accreditations. The colleges of Agriculture and Human Ecology, Business, Education, Engineering, and Nursing hold accreditations. Within the College of Arts and Sciences, the Chemistry program is accredited by the American Chemical Society [56]. Table 7

summarizes these accreditations.

Table 7. College and Program Accreditations.

College	Degree/Program	Accreditation
Agriculture and Human Ecology	Human Ecology (Baccalaureate) Didactic Program in Dietetics (Baccalaureate)	American Association of Family and Consumer Sciences (AAFCS) Accreditation Council for Education in Nutrition and Dietetics (ACEND)
Arts and Sciences	Chemistry (Baccalaureate)	American Chemical Society (ACS)
Business	Business Administration (Baccalaureate) Business Administration (Master) Accounting (Baccalaureate)	The Association to Advance Collegiate Schools of Business (AACSB International)
Education	Special Education; Child & Family Studies; Multidisciplinary Studies; Exercise Science, Physical Education & Wellness; Secondary Education (Baccalaureates) Curriculum & Instruction; Instructional Leadership; Educational Psychology & Counselor – Education; Exercise Science, Physical Education & Wellness (Master's) Curriculum & Instruction; Instructional Leadership; Educational Psychology & Counselor (Education Specialists) Fine Arts (Baccalaureate) Music (Baccalaureate)	Council for the Accreditation of Educator Preparation (CAEP) National Association of Schools of Art and Design (NASAD) National Association of Schools of Music (NASM)
Engineering	Chemical Engineering; Civil Engineering; Computer Engineering; Electrical Engineering; Mechanical Engineering (Baccalaureates) Computer Science (Baccalaureate) Manufacturing and Engineering Technology (Baccalaureate)	Engineering Accreditation Commission of ABET (EAC/ABET) Computing Accreditation Commission of ABET (CAC/ABET) Association of Technology, Management, and Applied Engineering (ATMAE)
Nursing	Nursing (Baccalaureate) Nursing (Master)	Commission on Collegiate Nursing Education (CCNE) Accreditation Commission for

Periodic program reviews and academic audits. In accordance with the 2010-15 performance funding guidelines of the Tennessee Higher Education Commission (THEC), each unaccredited baccalaureate and graduate program of TTU undergoes either an external peer review or an academic audit according to a pre-approved review cycle. A set schedule of program reviews and academic audits is conducted in a five-year cycle [57] [58] [59].

Institution-wide, ongoing program assessments. TTU utilizes many processes to improve student learning, provide feedback for program improvement, and present valid, reliable data to impact program changes. Centered in the Office of the Provost, assessments are implemented in conjunction with THEC Performance Funding requirements and SACSCOC guidelines [60].

Each academic program has identified measurable student learning outcomes and has assessment tools in place. Distance learning programs and programs with components at off-site locations also have planning and assessment processes consistent with their on-campus counterparts.

Individual Development and Educational Assessments (IDEA) [61], National Surveys of Student Engagement (NSSE)[62], California Critical Thinking Skills Tests (CCTST) [63], Alumni Satisfaction Surveys [64], and Employer Surveys [65] are examples of standardized and institutionally developed instruments used for university-wide assessments [66]. They assess student learning outcomes and educational experiences. These assessments are conducted on an ongoing basis [67]. The results of these assessments are made available on the TTU assessment website for wider dissemination [68].

The educational outcomes and competencies specific to various academic programs are assessed by major field tests, exit exams, and professional licensing examinations. The examinations for each program leading to licensure are mandated by THEC. TTU annually submits a Performance Funding report to THEC. The report summarizes the evaluation tools and the results.

The current structure of the general education core was developed as a system-wide initiative of the TBR Academic Affairs Office, as described in the narrative for CR 2.7.3. A common rubric of 41 credit hours, distributed over six areas — communication, history, humanities/fine arts, mathematics, natural sciences, social/behavioral sciences — was established, effective Fall 2004. In conjunction with indirect measures such as the National Survey of Student Engagement (NSSE), alumni surveys, and employer surveys, the annual direct assessment of "core competencies" (written and oral communication, mathematics, and critical thinking) provides a picture of the overall effectiveness of the TTU general education program. Additional details about how TTU identifies and assesses the attainment of college-level general education competencies may be found in the narratives for CS 3.3.1.1 and CS 3.5.1.

Evidence of continuous improvements and achievement of mission. The planning, evaluation, assessment, and budgeting processes at TTU have resulted in many accomplishments and improvements at the institutional and unit levels. A sample of key institutional accomplishments resulting from planned initiatives is briefly described below.

- Since 2010, several Living Learning Villages (LLVs) have been established at TTU. The Villages provide places for building lifelong social connections, developing richer engagement with areas of academic study, and providing students the opportunity for greater ownership over their living and learning lives while at the University. Each village is focused on a specific theme such as environmental learning or service leadership. The Living Learning Villages concept also fits into TTU's overall goal to boost student retention [69]. Results of a study demonstrate the positive impact of the TTU LLV program on student success and retention, which replicate research findings reported from other similar programs across the country [70].

- TTU's Millard Oakley STEM Center was opened in 2010 to enhance science, technology, engineering, and mathematics education for the region's students. In 2012, it received a grant of $0.5 million dollars from the State of Tennessee for the Upper Cumberland Rural STEM Initiative (UCRSI). As the official hub of UCRSI, the STEM Center supports and coordinates schools,

educators, and business partners in the region. Its programs reach more than 72,000 students in 20 Upper Cumberland counties. The Center fulfills an important role in TTU's mission to "enrich the lives of people and communities in the Upper Cumberland region of Tennessee" [71].

- For the past several years, TTU has consistently received high performance-funding scores from THEC. In fact, it received the highest score of all THEC (which includes the TBR and the University of Tennessee systems) institutions for the 2015 funding year [57] [72].

- In support of its strategic goal on improving efficiencies, TTU undertook, from January 2010 through July 2013, several initiatives such as energy conservation and campus sustainability, outsourcing, implementation of Banner document systems and workflow, use of electronic payment methods, and print reduction, all aimed at increasing efficient use of resources across the campus. The estimated total savings from these initiatives is over $3 million dollars a year [10] [11].

- In 2011, a Learning Commons was created in the Volpe Library with new services, spaces, and up-to-date technology and support. The Commons was one of TTU's key initiatives to improve student retention and graduation rates. New services included an IT help desk, a room for students to practice presentations, a demonstration room to help faculty integrate technology into the classroom, and a café. The Commons has contributed to a 78 percent increase in visitors to the Library. Improvements through major transformations continue as the Library becomes the location for the Center for Learning and Teaching and the Business Media Center (now known as iCube). Additional services such as the Digital Media Creation Lab will provide opportunities for students to use multimedia technologies for their projects. TTU's strategic goal of promoting innovation and research will be supported by the new Innovation and Discovery Center on the third floor. This Center is designed to provide open spaces for fostering cross-disciplinary, creative collaborations, and entrepreneurial ventures [73].

- A research-based paradigm shift occurred in the strategic planning and evaluation process leading to the development of the Flight Plan [16] [30].

- Recent initiatives undertaken by the Office of Research and Economic Development (ORED) have resulted in (i) the establishment of the Center for Healthcare Informatics; (ii) the development of a collaboration among Thermofield LLC, the Business Media Center, the Department of Chemical Engineering, the Center for Healthcare Informatics, and the Department of Electrical Engineering; (iii) the spin-off Cumberland Health Informatics company, which is under development; (iv) the development of a project for medical devices with two University of Alabama, Birmingham, faculty members; (v) the development of a software project on clinical informatics in collaboration with Vanderbilt University; and (vi) a proposal to develop an Innovation and Learning Center to be located in the Volpe Library [46]. These initiatives are aligned with the Flight Plan priority of multidisciplinary research innovation.

- Since 2013, students and advisors at TTU, utilize Degree Works, an academic advising and degree audit tool. It serves the Flight Plan focus area of improving the undergraduate student experience and the priority of technology services to students. For students, it provides real-time advice and counsel, speeds time to graduation and streamlines the graduation process. For advisors, it supports real-time delivery of academic advice, minimizes errors through consistent degree plans, and reduces paperwork and manual program check sheets [74].

- In Spring 2013, TTU implemented an event management system (EMS). The EMS system is software that allows users to view the actual features and technology resources of the rooms both on and off campus and check their availability. The major improvement with the EMS is the increase in transparency as to what rooms are available system-wide instead of having to phone individual departments to inquire about the room usage. Also, this software provides data on how the classrooms are being utilized. This initiative is linked to the Flight Plan focus area of transforming technology and the priorities of creating capacity for scheduling high-demand courses and improving the efficiency and effectiveness of operations [75].

- In 2014, The Student Success Collaborative (SSC), a resource for academic advisors at TTU became available. It allows advisors to make data-driven recommendations to students, as well as proactively reach out to students based on predictive analytics of student success with 10 years of TTU graduation data. It also allows them to intervene with students at risk who need extra assistance in critical foundational coursework. It enables the evaluation and comparison of alternative major decisions based on predicted academic performance. The SSC supports the Flight Plan focus area of improving the undergraduate student experience and the priority of technology services to students [76].

The mission of the academic and support units is aligned with TTU's mission. These linkages are indicated in the annual reports and the institutional effectiveness reports of the units. Through these linkages, the accomplishments and achievement of goals at the unit level are tied to the achievement of the institution's mission. The effectiveness of the above accomplishments in the achievement of TTU's mission is summarized in Table 8.

Table 8. Achievement of Mission: 2010-2014.

Mission Component: "Tennessee Technological University's mission as the state's only technological university is to provide leadership and outstanding programs in engineering, the sciences, and related areas that benefit the people of Tennessee and the nation. The University also provides strong programs in the arts and sciences, business, education, agriculture and human ecology, nursing, music, art and interdisciplinary studies. The University is engaged in scholarly activity, especially basic and applied research, creative endeavors, and public service, with special emphasis on community and economic development" **Institutional Outcomes:** • Innovation and Discovery Center in Volpe Library • New graduate programs • Technology and Infrastructure modernization • Consistently high scores in THEC Performance Funding • Initiatives undertaken by ORED
Mission Component: "The University is committed to the life-long success of students in its undergraduate, master's, specialist, and doctoral degree granting programs through high-quality instruction and learning experiences." **Institutional Outcomes:** • Learning Villages • 'Degree Works' • Student Success Collaborative • Event Management Systems
Mission Component: Tennessee Tech serves students from throughout the state, nation, and many other countries, but it retains a special commitment to enrich the lives of people and communities in the Upper Cumberland region of Tennessee." **Institutional Outcomes:** • Millard Oakley STEM Center • Learning Commons in the Volpe Library • Green Campus and sustainability initiatives

Progress on Flight Plan. The accomplishment and status (2014) of the 12 priority actions of the Flight Plan are documented in the *Priority Initiatives Status Report* [77].

The progress made on Flight Plan metrics is summarized in Table 9 and Figures 5-11. The performance

levels of ACT range, retention, and six-year graduation rates have remained steady. Four other metrics, i.e., undergraduate FTE enrollment, bachelor's degrees conferred, operating expenditures per FTE student, and endowment per FTE student have shown increasing (improving) trends. The growth in operating expenditures and endowments has outpaced the growth in FTE enrollment [78]. Consequently, since 2011-2012, operating expenditures per FTE student and endowments per FTE student have improved consistently. However, since 2010-2011, a declining trend has been observed in the number of master's degrees conferred, indicating an area for improvement.

Table 9. Progress on Flight Plan Metrics.

Flight Plan Metrics	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014
1a. ACT Composite Score Range- 25th Percentile	20	20	20	21	20
1b. ACT Composite Score Range- 75th Percentile	26	26	26	26	26
2. Full-Time-Equivalent Enrollment (12-Month)	9273	9489	9697	9761	9966
3. Bachelor's Degrees Conferred	1536	1626	1704	1840	1804
4. One-Year Retention Rate (Fall-to-Fall)	76%	73%	70%	75%	76%
5. Six-Year Graduation Rate	48%	48%	50%	52%	51%
6. Doctoral Degrees Conferred	19	21	18	12	23
7. Master's Degrees Conferred	454	506	347	312	300
8. Total Research Expenditures Per Full-Time Tenured Faculty	45695	42560	36341	39483	39108
9. Operating Expenditures Per FTE Student*	11976	12582	12906	13265	13909
10. Endowment** Per FTE Student	5387	6265	6062	6754	7500

*Operating Expenditures are the sum of expenditures in Instruction, Academic Support, Institutional Support, Student Services, and Scholarships & Fellowship Expenses.
**Market Value at End of Fiscal Year
Source: Tennessee Technology University Information for *Integrated Postsecondary Education Data System (IPEDS)*,
2009-2010 - 2013-1014.

Undergraduate Education
(ACT Composite Score Range)
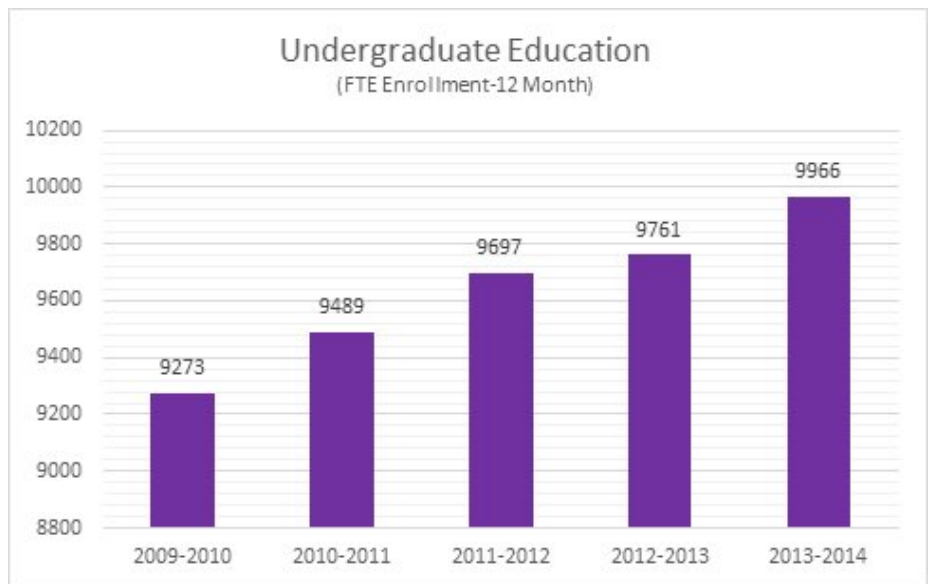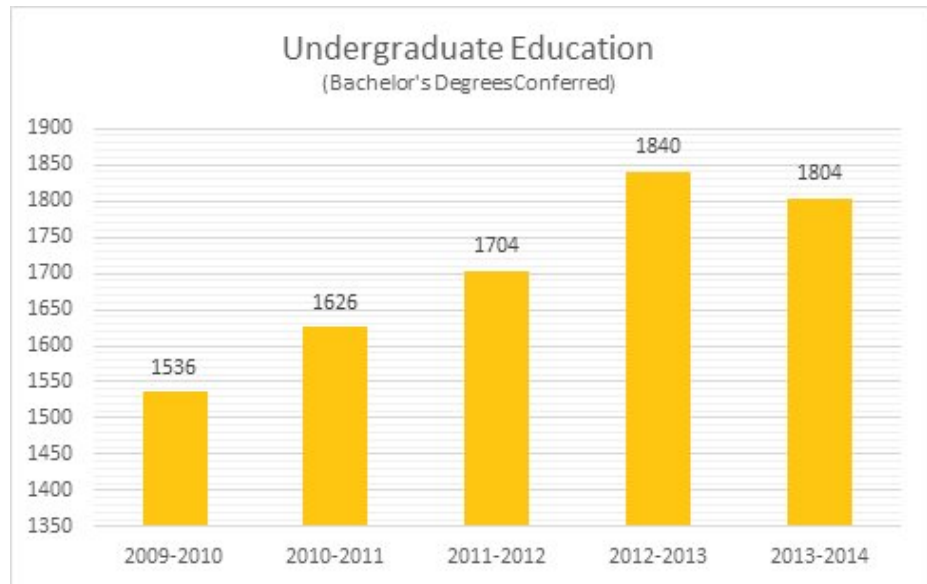
30

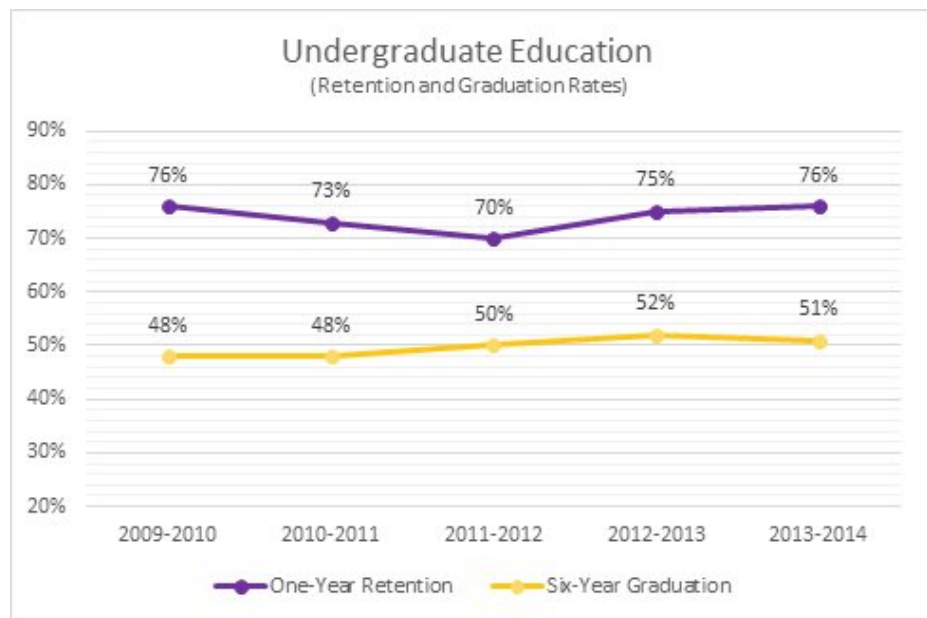26   26   26   26   26
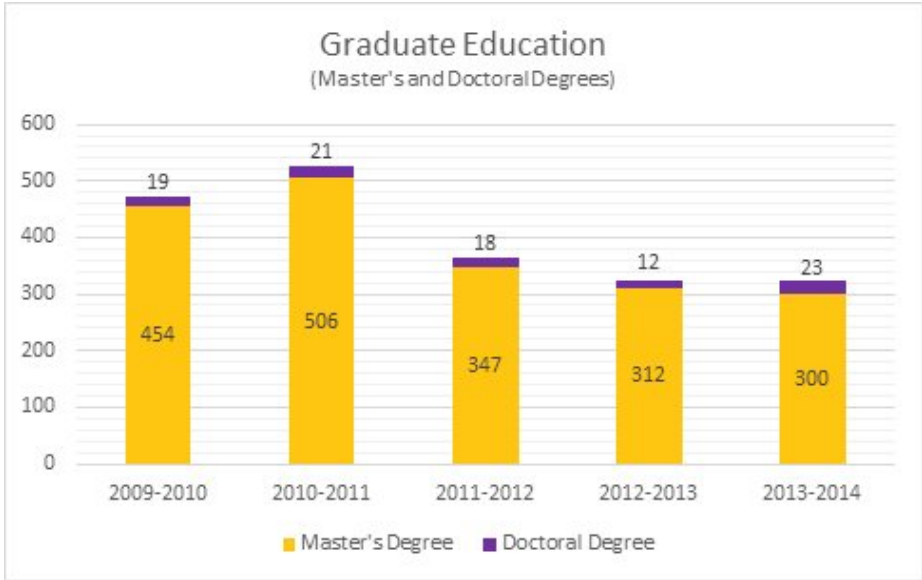
Figure 5.

Figure 6.

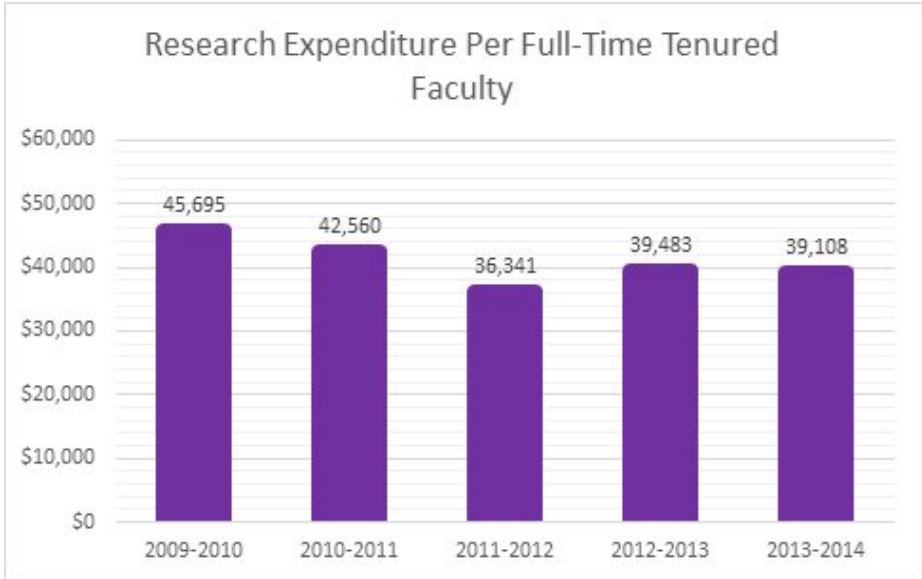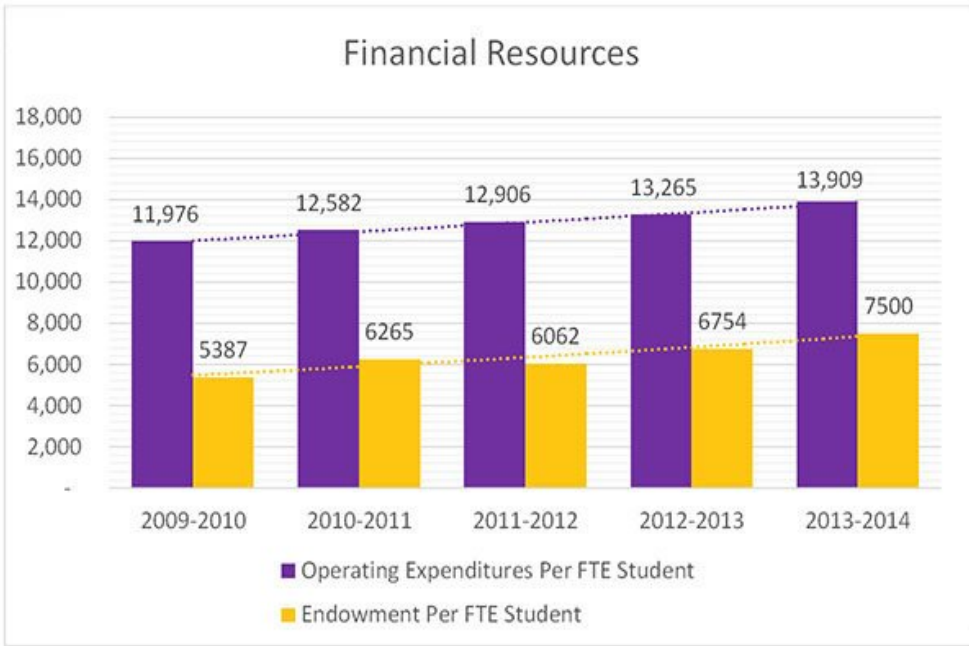Figure 7.

Figure 8.

Figure 9.

Figure 10.

Figure 11.

Additionally, Tables 10 and 11 summarize the improvements made in 2014-15 and 2013-2014 on other key institutional effectiveness metrics [35a] [35c] [35d].

Table 10. Institution-Wide Improvements, 2014-2015.

Performance Metric	Results
ACT Composite Score Range	The 25th to 75th percentile for Fall 2014 improved from 20/26 in Fall 2013 to 21/27.
Scholarships & Graduate Assistantships	Approximately $5,000,000 has been committed in new scholarship funds over four years. An additional $800,000 will be committed in 2015. $1,000,000 one-time fund distributed for Graduate Assistantships.
Student Success	The College of Agriculture and Human Ecology established a Student Success Center.
Undergraduate Research and Creative Activity (URECA) Program	34 Summer grants, 40 Mini-grants, 71 student travel grants, totally $149,500 were awarded.
Student Travel Request Grants	298 student requested funds from the Provost's Office. These grants totaled $284,461.
Alumni Financial Success	TTU graduates leave with the least debt in the South.* Based on total cost and alumni earnings, TTU provides students with the highest return on investment for any public university in the state and third overall among public and private institutions in Tennessee.**
Establishment and inaugural of the Community Day Event	An estimated 1,800 visitors (about 700 prospective students) visited the campus.
Successful accreditation and audit of several programs.	5 academic programs (three undergraduate and two graduate programs) have successfully gone through TBR mandated academic audits.
New academic programs	22 new programs submitted or in preparation (Ph.D., Master's and new concentrations).
New faculty hires	19 Tenured/Tenure-Track faculty, 1 Lecturer, and 25 one-year appointments were hired.
Faculty Development	33 Faculty requested Development travel funds totally $33,470. Overall faculty development funding was increased by $50,000
QEP Awards	QEP awards were presented to 30 faculty members.

*Source: *U.S. News & Report 2015.*
**Source: Payscale.com 2014
 https://www.tntech.edu/about/rankings [79]

Table 11. Institution-Wide Improvements, 2013-2014.

Performance Metric	Results
Overall Enrollment	2% increase in Fall 2014. All but one TBR institution showed declines.
Freshman retention	6% increase in two year period.
New Faculty Hires	53 new faculty and department chairs hired. Other searches are ongoing.
Additional temporary faculty	One million dollar in additional funding for new hiring.
New graduate students	14% increase. 270 new graduate students.
Highest performance funding score	97.5 in 2013-14 for FY2015 is the highest among all THEC institutions. This

	corresponds to incentive funding of 5.4% in additional appropriations.
Number of Women in STEM disciplines	952 in Fall 2014, a record high.

Numerous improvements — driven by assessments — have occurred in the individual academic programs and the administrative and support units and in research and public service activities at TTU. Details regarding these improvements and the assessment data that form the bases for those improvements are given in the narratives for CS 3.3.1.1-CS 3.3.1.5 and also available in Evidentiary Document [44].

Conclusion

The body of evidence presented in this narrative warrants the following conclusions. Institutional effectiveness at TTU is multifaceted and addresses all the components of the University's mission. The institution engages in ongoing, research-based planning, evaluation, assessment, and resource allocation processes that integrate the state, institution, program, and unit level plans and activities. The evidence indicates that these processes are flexible, responsive, evolving, and maturing. Collectively, they have enabled systematic reviews, continuous improvements, the achievement of institutional effectiveness, and an achievement of TTU's mission, thus demonstrating compliance with Core Requirement 2.5.

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[65] Employer Surveys

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