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The development strategy of smart campus for improving excellent navy human resources

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Abstract

The globalization process gave birth to an era known as the Industrial Revolution 4.0, which was marked by the existence of Information Communication Technology (ICT) such as artificial intelligence, advance robotic, autonomous vehicles, virtual reality, and cyber-physical systems. ICT raises a major and fundamental change in human life where there has been a shift in activities that were originally carried out in the real world now carried out in cyberspace. All digital and all activities carried out online or internet media. This study aims to obtain the development of the Smart Campus strategy in the Indonesia Naval Technology College (STTAL), to improve excellent human resources. The method applied in this research is to use an operational approach to qualitative analysis on a real strategy implemented. The results obtained are the development of Smart Campus at STTAL carried out with integrated and systemic e-Office, e-Learning, e-Library, and Academic Information System programs. The Smart Campus program development strategy can increase STTAL's human resources to be excellent and advanced. Human resources include professional lecturer resources, smart students, stakeholder partners, and educational employees. The conclusions and contributions obtained are the development of Information Communication Technology (ICT) based on Smart Campus (e-Office, e-Learning, e-Library, and integrated Academic Information System) has a high role to improve professionalism in organizing advanced and quality higher education so that it can produce excellent Indonesian human resources.

Keywords: Smart Campus; Information Communication Technology (ICT); Excellent Human Resources

1. Introduction

Every university requires smart campus-based ICT devices. The presence of smart campus-based ICT gave birth to a new civilization in the field of information and communication technology that has entered the era of digitalization. Various technology products and procedures are transformed into virtual and digital. Modern society has expanded its meaning to the digital society. Previously the service used paper and physical documents, now the service has been in the form of paperless and soft-files. In this era of digitizing bureaucratic and administrative services are becoming increasingly effective, efficient, and optimal [5]. ICT encourages the birth of the concept of smart campus in a tertiary environment, considering that tertiary institutions are one of the places where users with different backgrounds meet to carry out various educational activities by using and utilizing ICT. Management of services, students, lecturers/educators, education staff, stakeholders, and campus activities is the biggest challenge for universities. To face these challenges, a Smart concept is required that must be adopted by the campus [11]. The main principle of Smart Campus is to provide high-quality services, protect the environment and save costs.

Some Smart Campus-based ICT system services are now being developed in several leading universities in the world and at Indonesia, including New Student Admission Management Information System (Indonesian name: SIMARU), Academic Information System (Indonesian name: SIAKAD), Online Office Administration System (Indonesian name:

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SIAPO or e-Office), Online Learning System (e-Learning), Financial Information System (Indonesian name: SISKEU), and Library Management Information System (Indonesian name: SIMPUS or e-Library). The application of ICT services based on Smart Campus turned out to be able to bring universities to rank as quality universities, meet and even exceed national quality standards for higher education under Law No. 12 of 2012 on Higher Education. Smart Campus-based ICT can be utilized optimally to improve and improve the quality of the STTAL processes, outputs and outcomes [14].

Right on March 15, 2020, STTAL is even 54 years old, an age that is no longer young, it can even be said to be an adult age, according to the theory of the stages of the development of human life. As a mature university, STTAL has produced alumni of 1999 graduates spread across various work units in the Navy/Military/Government Agencies with various strategic positions. Now at the age of 54, STTAL is in the stage of the industrial revolution 4.0 and is undergoing major and fundamental changes. To be able to appear like an advanced college, with superior human resources, one of the strategic steps taken is to utilize and utilize Smart Campus-based Information Communication Technology (ICT) into the institutional governance system (e-office), learning system (e-learning), library service systems (e-libraries) and academic information systems The average tertiary institution which ranks as an excellent and World Class University, has implemented a smart campus with an effective, efficient and productive management governance system [16].

1.1. The Urgency of ICT Based on Smart Campus

The Urgency of ICT Based on Smart Campus is expected to produce Excellent Human Resources at University that can receive, transfer and apply technology in the rank of maritime technology. Some research related to this work includes The application of CBA and SUG models for improving the quality of Indonesian navy human resources [2], Applied Fuzzy and Nasa TLX method to measure the mental workload of Navy personnel [3], The relationship model of maritime culture and state policy towards national resilience for improving navy personnel [4], the Development strategy of national food sovereignty to encounter radicalism threat [6], The system dynamic model for policy evaluation of navy personnel on state-duty aspects [7] Analysis and scenario of navy performance allowance policy using the dynamic system model [8], and The naval harbors priority development using the zero-one matrix decision variable (ZOMDV) and Fuzzy MCDM methods [13]. All of this research becomes input and review for problem-solving in this study.

2. Material and methods

2.1. Smart Campus Concept

The Smart Campus system concept has successfully integrated all application activities and educational transactions into one application and transaction system, which includes office administration (e-Office), learning systems (e-Learning), electronic libraries (e-libraries), and information systems academic (Academic Information System) as shown in Figure 1. Smart Campus-based ICT program, which integrates e-Office, e-Learning, and e-Library applications, with the existing Academic Information System application as a unity in the technology system STTAL information and communication to maximize the achievement of three main missions of higher education namely Tri Dharma Perguruan Tinggi (education, research and community service) and other aspects. Tri Dharma University's performance is the main reference in managing the process of institutional management towards a better direction [10].

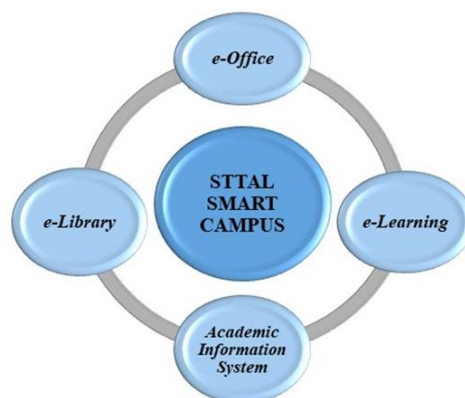


Figure 1 Smart Campus-Integration of e-Office, e-Learning, e-Library, and Academic Information Systems

2.2. The Concept of e-Learning

The application of information and communication technology in higher education has been regulated in Law of the Republic of Indonesia Number 12 of 2012 concerning Higher Education, Chapter II Implementation of Higher Education, Part Seventh Part of Distance Education, article 31 which regulates the implementation of distance education through the use of various communication media, so able to accommodate students who cannot attend face to face or regular and expand access and facilitate higher education services in education and learning. The use and utilization of information and communication technology in education and learning finally gave birth to the concept of e-Learning as a result of innovation in the field of learning technology, which provides convenience, speed and comfort for anyone who wants to learn. Through e-Learning, the interaction of lecturers with students and access to learning resources becomes much broader, deep, flexible, and not limited by space and time. The use and use of e-learning also encourages a paradigm shift in education and learning from Teacher-Centered Learning (TCL) to Student-Centered Learning (SCL).

Some experts who support the opinion of e-Learning as electronic-based include [9], [10] who explained that e-Learning is learning where learning material is delivered through electronic media such as the internet, intranet, satellite, TV, CD-ROM, etc. others, so there is no need for the internet because learning with the internet is one part of e-Learning. This opinion is supported by Martin Jenkins and Janet Hanson, Generic Center (2003) that e-Learning is a learning process that is facilitated and supported through the use of communication information technology. So in its implementation, e-Learning uses audio, video or computer equipment or a combination of the three. In other words, e-Learning is learning which in its implementation is supported by technology services such as telephone, audio, videotape, satellite or computer transmission [9].

2.3. The Concept of e-Library

The application of information and communication technology in libraries is functioned in various forms and has been mandated in RI Law Number 43 the Year 2007 concerning Libraries, article 12 paragraph 1, article 14 paragraph 3, article 19 paragraph 2, article 22 paragraph 3, article 23 paragraph 5, article 24 paragraph 3, article 38 paragraph 2, article 42 paragraph 3 as well as in General Explanation, Part 1 general. One form of information and communication technology applications in the library is realized in the form of a library management information system, or what is known as an electronic library or electronic library (e-Library). Fields of work-integrated in this system are acquisitions, cataloging, circulation and services, preservation, and bibliometric statistics of library materials. Besides that, the application of information technology is also used as a supporting means in activities to obtain, store and disseminate information in the complexity of library services. Previously library materials were stored in devices such as microfilms, videotapes, audiotapes, and similar multimedia devices, now content is developing using compact discs or laserdiscs that are capable of storing digital data, and electronic databases, even now developing again through media gadget devices such as mobile phones, iPods, PDA's, blackberries, and so on [12].

The existence of e-Library (Electronic Library) is very important in helping the learning process in higher education especially related to independent learning (Delaney Robert, 2010). Why is that, because the information and facilities provided in the e-Library make it easier for students and lecturers to do various things related to the learning and research process. The characteristics of e-library that allow global access without being limited by place and time are important points for students and lecturers in utilizing all available resources for independent learning. The existence of e-Library strongly supports the existence of this independent activity process, including conducting research. Various scientific sources that exist in electronic libraries even allow people to do research online just by sitting at a computer [1].

2.4. The Concept of e-Office

The application of information and communication technology to the government is regulated in the Republic of Indonesia Presidential Regulation Number 95 of 2018 concerning Electronic-Based Government Systems. Electronic-based Government System hereinafter referred to as SPBE, is the administration of government that utilizes information and communication technology to provide services to SPBE users to realize clean, effective, transparent and accountable governance as well as quality and reliable public services. SPBE itself in its implementation is often referred to as e-government which is a new chapter for governance or government management in Indonesia, where all government agencies are required to implement SPBE.

The development of e-Government is an effort to develop governance based on (using) electronics to improve the quality of public services effectively and efficiently. Through the development of e-Government management systems and work processes in the government, the environment is carried out by optimizing the use of information technology.

The use of information technology includes 2 (two) related activities, namely: (a) data processing, information management, management systems, and electronic work processes; and (b) utilizing information technology advancements so that public services can be accessed easily and cheaply by people in all regions of the country. One form of e-Government applications is the electronic office or known as e-Office to support digital office administration service activities [5].

2.5. The Concept of Academic Information System

Academic Information System is an information and communication technology-based system that was built to provide convenience to users in campus academic administration activities online, such as the process of admitting new students, preparing curriculum and making lecture schedules, filling in Study Plan Cards (KRS), filling in grades, guardianship, lecturer and student data management, and so on. Academic Information Systems can also function as a support for data analysis in determining campus decisions [9]. Academic Information Systems have high benefits, especially in terms of (a) making it easier for students to obtain information without having to come to the administration section on campus which often takes a long time because they have to queue. (b) The campus administration section is also facilitated by the Academic Information System because of the reduced burden of interacting with students who require data so that the administration can focus more on data input and data checking. (c) Data is stored in a structured manner with a database stored on a computer. (d) Data updating between the campus administration section and the finance department can be done quickly in real-time. In this millennial era, the campus needs to update its administration system on campus by using an Academic Information System that is integrated with other systems. The application of the Academic Information System on campus can increase the effectiveness, efficiency, and productivity [10].

3. Results and discussion

Several main reasons make Smart Campus-based ICT development that integrates e-Office, e-Learning and e-Library with STTAL Academic Information Systems has a high urgency, including:

- Effectiveness and efficiency in achieving educational goals can be achieved through the integration of e-Office, e-Learning, and e-Library with STTAL Academic Information Systems. The integration of information network systems can make it easier for university management to achieve goals according to national standards set by the Directorate of Higher Education. Besides that, economically it can reduce the operational costs of high education, the need for human resources is very much, and the achievement of a long time. Efficiency can be done through the application of information and communication technology based on the Smart Campus.
- The main principle of Smart Campus is to provide high-quality services to all academic community (students, lecturers, education staff) and related stakeholders (users, universities and partner institutions, etc.). Smart Campus which integrates e-Office, e-Learning, and e-Library with STTAL Academic Information System, can provide excellent, best, fast and safe services. Therefore, the Smart Campus concept requires the involvement of all academic community members and good collaboration with relevant stakeholders in organizing every program activity that is managed in an integrated manner in one network.
- Applications that integrate e-Office, e-Learning, and e-Library with the Academic Information System STTAL can present accurate, objective and transparent data that is far from subjectivity. All data can be read, uploaded, or downloaded anytime, anywhere, with various facilities, convenience, security, is not constrained by time and space, and displays the data as it is without engineering.
- The final results of processing and analyzing data from applications that integrate e-Office, e-Learning and e-Library with the Academic Information System STTAL can be used as one of the main reference sources for STTAL leaders to take appropriate policies and decisions based on principles scientific data that can be accounted for.

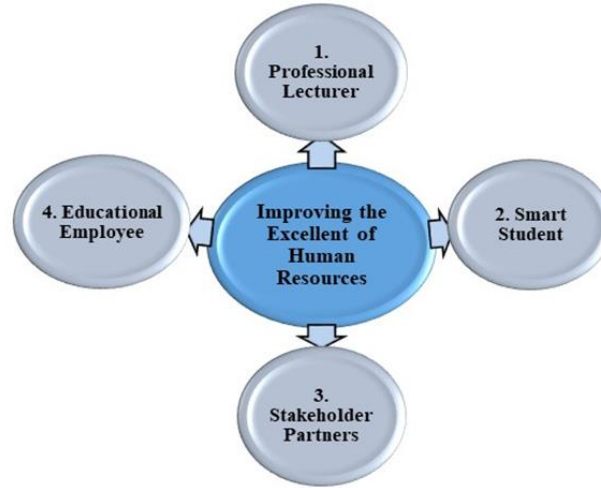


Figure 2 Improving the Excellent of Navy-STTAL Human Resources

3.1. E-Learning Application

As a STTAL higher education institution running the STTAL e-Learning application to increase superior human resources. All technologies are used to support teaching efforts through internet electronic technology. Internet, Satellite, Audio/video tape, Interactive TV, and CD-ROM are some of the electronic media used. Teaching is delivered at the same time (synchronously) or at different times (asynchronously). Along with the use of the internet for learning, STTAL has developed a lot of distance learning. In general, there are three basic perceptions about the e-Learning function at STTAL, namely:

- Virtual Class (Long Distance Learning). e-Learning is perceived to function as distance learning, where lecturers can teach anytime and anywhere without constraints on place and time.
- Learning Management System (LMS). e-learning is perceived to function as an instrument that makes it easy for learning managers to manage their learning effectively, efficiently and attractively, starting from the preparation, implementation, monitoring and evaluation stages.
- Computer-Based Training (CBT). e-learning is perceived to function as electronic-based learning where learning maximally utilizes information and communication technology, especially in the form of electronics. That is, not only the internet but all electronic devices such as films, videos, tapes, OHPs, slides, LCDs, projectors, simulators, and others.

3.2. E-Library Application

The STTAL Electronic Library (e-Library) is a source of information that is available online and is 'open' due to the 'automatic' sharing process that exists in modern library models. STTAL e-Library makes it very easy for students to find learning resources, even the lecture process does not have to be from lecturers who 'learn' and then deliver it in class, but it can be started from students who raise certain problems from electronic information sources obtained through searching on the library. This means that between lecturers and students have the same opportunity in obtaining the 'knowledge' needed in the learning process. Especially with a large number of electronic information sources such as electronic journals, electronic books, electronic papers and electronic databases provided by libraries, the opportunity is becoming more open. Studying independently, for now, is something that is 'fun' and is very possible for students to do without worrying about a lack of information resources.

3.3. E-Office Application

The Electronic Office (e-Office) STTAL is a system that deals with administration and virtual centralize the components of an organization where data, information, and communication are made through telecommunications media. E-office information and communication system is one of the media that connects all components in an organization to make it easier to manage all transactions that become the core business of the organization. In the past, correspondence transactions between institutions in an office environment were carried out manually, so that it took several hours for the letter to reach its destination, but in this digitalization era, the presence of e-Office was something very valuable,

considering its existence was able to provide more services fast, easy, and real-time, so that the process, output, and outcome of activity can run effectively, efficiently and productively.

The existence of the STTAL e-Office application can save the use of paper (paperless administration) and time (real-time). Electronic in e-Office can mean that all work related to office administration is done electronically and uses the help of communication tools and information systems. With the development of current telecommunications technology, which is supported by high-speed broadband networks, and the availability of the internet, offices will become all-digital and transform into virtual offices. The leadership disposition can be done online and the distribution of correspondence can be carried out via email and SMS notification.

3.4. The Integration of STTAL e-Library, e-Learning, and e-Office with Navy Academic Information System.

To provide the best-integrated quality services in the organization of University Duty, STTAL develops an integrated information network system based on STTAL Navy Smart Campus, with general specifications, as follows:

- The system is built based on Web using software applications that are easily obtained in the country and do not need to import from other countries.
- Users/Members/STTAL academicians can access administrative data, media, and learning materials as well as library collections according to their needs, responsibilities, and authority quickly, easily and properly by using the system application service modules.
- The system application service module must cover all office administration, learning, library and Academic Information System activities at STTAL.
- The low failure rate of application services in each work unit caused by system, network, and data communication errors.
- The system can be operated in the scope of intranet or extranet with infrastructure/network facilities that already exist in the STTAL environment.
- Having a reliable security system refers to Navy standards and can provide flexible access, including:

a) User safety.

b) Data and information security.

c) Application security.

d) Network and communication security.

- Having high data integrity, namely the ability to guarantee data accuracy every time changes occur.
- Able to provide data and information services to support leadership decisions in a timely, accurate, safe, orderly, up-to-date and integrated manner.
- Able to do the process of entry/update/delete data, learning media, and the catalog of digital library collections of the Navy College of Technology.
- Easy to use (user friendly) and implement a multi-user system.
- Flexible in the application of network topology needs that are always flexible according to the needs and development of the organization.
- Integrated into one Single Sign-On (SSO) card equipped with RFID and connected with another Management Information System (MIS) with Headquarters, National Library, and universities/partner institutions that collaborate.



Figure 3 Single Sign-on Card (SSO) Equipped with RFID

3.5. Internal Factor Analysis.

According to the STTAL assessment result, there were several internal factors which became the strengths and weaknesses of technological mastery as mentioned below..

3.5.1. Internal Factor

Strength

- Able to develop smart campus of technology
- Able to develop smart campus ICT system.
- Had cyber infrastructure in the smart campus headquarter
- Z generation of smart campus who were familiar with computation
- Technology transfer cooperation who opened the opportunity for smart campus technological mastery.
- Had maintenance system until organic stage
- There was a smart campus Committee of Defense Industry as the basic of independent technological development
- Organization of smart campus managerial which was solid enough
- Presence of the blueprint of Smart Campus 2024.
- As the biggest smart campus organization in Southeast Asia
- Logistic supporting system which was systematic and well-structured from the campus organization

Weakness

- Limited stealth aircraft of Navy Smart Campus
- Absence of electro molecular system in Navy Smart Campus
- Navy Smart Campus technology which was still in the stage of prototype.
- The Big Data Analysis smart campus technology which was still hack-prone.
- Partially data smart campus analysis.
- Absence of integrated smart campus energy management system yet.
- Hack-prone in the smart campus Major Command level
- Electronic smart campus warfare technology which was still limited
- Absence of the use of human augmentation smart campus technology
- Limited smart campus manufacturing tools.
- Technology of smart campus development was dependent to import policy.
- Budget strength of smart campus was below the standard (5% of GDP).
- Research and development of smart campus were not in line with defense industry

3.6. External Factor Analysis

The STTAL assessment result showed that there were some external factors which became the threats and opportunities in technological mastery as mentioned below

3.6.1. External Factor

Threat

- Dependent to unrenewable resources
- Fund for research and development was limited
- Threat of cyber-attack.
- Threat of data hack.
- Natural resources as the target of many countries.
- Threat as the weapon market.
- Radicalism and communism threat.
- Threat as a traffic when there was a conflict between countries.
- Social gap.

Opportunity

- National economy growth which was above global economy growth.
- Abundant stock of alternative energy.
- Low wage level
- There was a legal protection of defense industry.
- Vast development of internet
- Internet system which supported the decision-making time
- Policy of the government
- As the biggest democratic country
- Bonus of population demographic

Based on the identification from various internal and external factors, the next step was arranged to be factors of strategy. The existing internal and external factors were combined to determine an alternative for the strategy of navy posture development. In this following table presented the strategies which were formulated from the SWOT matrix.

3.6.2. SWOT matrix of Strategy Formulation

Strategy (SO)

- Smart campus technology development which reached production stage.
- Development of unmanned system based on smart campus to production level
- Development of smart campus cyber infrastructure to the level of Major Command.
- Implementation of smart campus technology transfer
- Development of blue print that was suitable with naval smart campus technological mastery

Strategy (ST)

- Implementation smart campus management of energy and development of renewable resources
- Optimization of the ability of smart campus Z generation in the system of information and cyber development
- Improvement of the STTAL smart campus diplomacy ability as the balance of power in Asia Pacific

Strategy (WO)

- Development of STTAL smart campus unmanned technology
- Integration of big data analytics of smart campus to the high level
- Improving electronic warfare of smart campus ability to the fifth level.
- Upgrade of smart campus manufacturing tools.
- Development of smart campus technology by focusing on domestic procurement.
- Doing a research smart campus which was suitable with defense industry.

Strategy (WT)

1. Improvement of standard smart campus defense budget strength (5% GDP) gradually.

The data from the table above, there were five points of SO strategy and three points of ST strategy for naval technological mastery, followed by six points of WO strategy and one point of WT strategy. They were compiled into fifteen strategies for the naval technological mastery.

3.7. Compilation of Navy Technology for Smart Campus STTAL System Strategy.

Navy Technology Aspect for STTAL smart campus System

Code	Sub Strategy
SO-1	Development of Smart campus -technology development to production stage
SO-2	Development of smart campus unmanned system based on production level.
SO-3	Development of smart campus cyber infrastructure to the level of Major Command
SO-4	Implementation of smart campus technology transfer.

- SO-5 Development of smart campus blue print that was suitable with naval technological mastery
- ST-1 Implementation smart campus management of energy and development of renewable resources
- ST-2 Optimization of the ability of smart campus Z generation in the system of information and cyber development
- ST-3 Improvement of smart campus the diplomacy ability as the balance of power in Asia Pacific
- WO-1 Development of smart campus unmanned technology
- WO-2 Integration of smart campus big data analytics to the high level
- WO-3 Improving of smart campus electronic warfare ability to the fifth level.
- WO-4 Upgrade of smart campus manufacturing tools.
- WO-5 Development of smart campus technology by focusing on domestic procurement.
- WO-6 Doing a research of smart campus which was suitable with defense industry.
- WT-1 Improvement of smart campus standard defense budget strength (5% GDP) gradually.

Structure of element above showed that WT-1 strategy was in priority 1, while strategy of ST-1 and WO-5 was in priority 2, ST-3 strategy was in priority 3, also SO-1 and WO-1 strategy were in priority 4. In priority 5, there were four strategies namely SO-2, SO-3, SO-4, and WO-2. Strategy of WO-4 was in priority 6, WO-3 and ST-2 strategy were in priority 7, SO-5 strategy was in priority 8 and WO-6 in priority 9.

3.8. Smart Campus Strategy Mapping

Strategy mapping presented a portrayal of how each work could support the whole strategic achievement of the organization. Strategy mapping helped the organization to especially visualize what was needed to do and support the development strategy of integrated fleet weapon system.

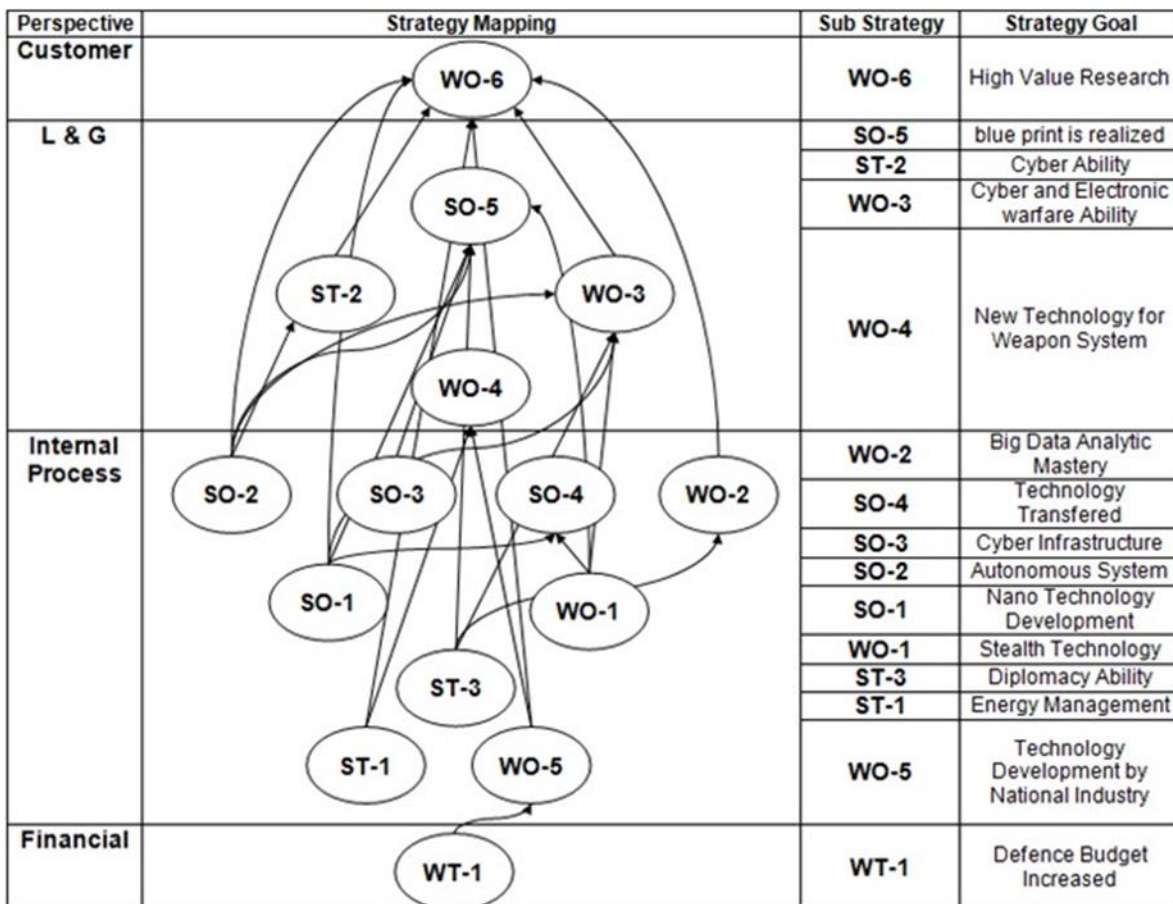


Figure 4 Strategy Mapping Smart Campus STTAL For Improving Navy Excellent Human Resources.

4. Conclusion

From the results of the discussion above, it can be concluded that the development of ICT based on Smart Campus (e-Office, e-Learning, e-Library, and integrated Academic Information System) has a high role to improve professionalism in organizing advanced and quality higher education so that it can produce superior human resources as expected by the Navy to master and develop science and Maritime technology in Indonesia. The strategy mapping created structure presented that financial perspective was made of one strategy target: improvement of defense budget. Nine strategy targets were in the internal process perspective, and they were 1) Big Data Analytic Mastery; 2) Technology Transferred; 3) Cyber Infrastructure; 4) Autonomous System; 5) SmartTechnology Development; 6) Stealth Technology; 7) Diplomacy Ability; 8) Energy Management; 9) Technology Development by National Industry. Learning & Growth perspective was made of four strategy goals namely 1) Blue Print is Realized; 2) Cyber Ability; 3) Cyber and Electronic Warfare Ability; 4) New Technology for Weapon System. In addition, customer aspect consisted of one strategy goal, High Value Research.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare no conflict of interest.

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