The Alignment of IT and Business Strategy at ROC Leeuwenborgh

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Table of Contents

Preface xi

Conference Organization xii

Program Committee xiii

Reviewers xv

Classification and Correlation Techniques

Gesture Recognition for Indonesian Sign Language Systems (ISLS) Using Multimodal Sensor Leap Motion and Myo Armband Controllers Based on Naïve Bayes Classifier 1

Khamid, Adhi Dharma Wibawa, and Surya Sumpeno

Waah: Infants Cry Classification of Physiological State Based on Audio Features 7

Ramon L. Rodriguez and Susan S. Caluya

Fuzzy Clustering and Bidirectional Long Short-Term Memory for Sleep Stages Classification 11

Intan Nurma Yulita, Mohamad Ivan Fanany, and Aniati Murni Arymurthy

MFCC Feature Classification from Culex and Aedes Aegypti Mosquitoes Noise Using Support Vector Machine 17

Achmad Lukman, Agus Harjoko, and Chuan-Kay Yang

Automatic Chord Arrangement with Key Detection for Monophonic Music 21

Bor-Shen Lin and Ting-Chun Yeh

Credit Scoring Refinement Using Optimized Logistic Regression 26

Hendri Sutrisno and Siana Halim

Anomaly Detection System Based on Classifier Fusion in ICS Environment 32

Jan Vávra and Martin Hromada

Efficient Object Recognition with Multi-directional Features in Urban Scenes 39
Ryo Kawanami and Kousuke Matsushima

Feature Extraction and Image Recognition Methods

Timor Leste Tais Motif Recognition Using Wavelet and Backpropagation 45
Vasio Sarmento Soares, Albertus Joko Santoso, and Djoko Budyanto Setyohadi

The Model and Implementation of Javanese Script Image Transliteration 51
Anastasia Rita Widiarti, Agus Harjoko, Marsono, and Sri Hartati

Human Activity Recognition by Using Nearest Neighbor Algorithm from Digital Image 58
Muhammad Ihsan Zul, Istianah Muslim, and Luqman Hakim

Night to Day Algorithm for Video Camera 62
Stefan Jack Lionardi, Mariëlle Fransen, and Andreas Handojo

Arca Detection and Matching Using Scale Invariant Feature Transform (SIFT) Method of Stereo Camera 66
Aviv Yuniar Rahman, Surya Sumpeno, and Mauridhi Hery Purnomo

The Application of Deep Convolutional Denoising Autoencoder for Optical Character Recognition Preprocessing 72
Christopher Wiraatmaja, Kartika Gunadi, and Iwan Njoto Sandjaja

Acne Segmentation and Classification Using Region Growing and Self-Organizing Map 78
Gregorius Satia Budhi, Rudy Adipranata, and Ari Gunawan

Algorithms for Intelligent Computation

Extended Concept of Generalized Fuzzy Rough Sets on Asymmetric Fuzzy Coverings 84
Rolly Intan

The Proposal of the Software for the Soft Targets Assessment 90
Lucia Duricova, Martin Hromada, and Jan Mrazek

Application of Artificial Intelligence (AI) in Search Engine Optimization (SEO) 96
Yodhi Yuniarthe

Spatial Model Design of Landslide Vulnerability Early Detection with Exponential Smoothing Method Using Google API 102
Kristoko Dwi Hartomo, Sri Yulianto, and Joko Ma'ruf

Measures of Dependency in Metric Decision Systems and Databases 107
Anh Duy Tran, Somjit Arch-int, and Ngamnij Arch-int

Multiple Scattered Local Search for Course Scheduling Problem 114
Ade Jamal

The Software Proposes for Management and Decision Making at Process Transportation 120
Jan Mrazek, Lucia Duricova, and Martin Hromada

Distributed Systems and Computer Networks

A Self-Adaptive Architecture with Energy Management in Virtualized Environments 124
I Made Murwantara, Behzad Bordbar, and João Bosco Ferreira Filho

Nanoservices as Generalization Services in Service-Oriented Architecture 131
Sutrisno, Frans Panduwinata, and Pujianto Yugopuspito

Automated Concurrency Testing for Cloud-Based Polling Systems 138
Hans Dulimarta

Low-Overhead Multihop Device-to-Device Communications in Software Defined Wireless Networks 144
Riyanto Jayadi and Yuan-Cheng Lai

A Secure Anonymous Authentication Scheme for Roaming Service in Global Mobility Network 150
Kuo-Yang Wu, Yo-Hsuan Chuang, Tzong-Chen Wu, and Nai-Wei Lo

Linux PAM to LDAP Authentication Migration 155
Justinus Andjarwirawan, Henry Novianus Palit, and Julio Christian Salim

Exploratory Research on Developing Hadoop-Based Data Analytics Tools 160
Henry Novianus Palit, Lily Puspa Dewi, Andreas Handojo, Kenny Basuki, and Mikiavonty Endrawati Mirabel

Mobile and Pervasive IoT Applications

Human Heart Rate Detection Application 167
Semuil Tjiharjadi and Aufar Fajar

Near Field Communication Technology in Delivering Information in Museums 173
Djoni Haryadi Setiabudi, Ryan Christian Wiguno, and Henry Novianus Palit

Android Application for Monitoring Soil Moisture Using Raspberry Pi 178
Lily Puspa Dewi, Justinus Andjarwirawan, and Robin Putra Wardojo

Development of Mobile Indoor Positioning System Application Using Android and Bluetooth Low Energy with Trilateration Method 185
Agustinus Noertjahyana, Ignatius Alex Wijayanto, and Justinus Andjarwirawan

Assessments of Integrated IS/IT

The Proposal of United Crisis Management Information Systems of the Czech Republic 190
Katerina Vichova, Martin Hromada, and Ludek Lukas

The Analysis of Academic Information System Success: A Case Study at Instituto Profissional De Canossa (IPDC) Dili Timor-Leste 196
Apolinario Dos Santos, Albertus Joko Santoso, and Djoko Budiyanto Setyohadi

Identification of Factors Influencing the Success of Hospital Information System (SIRS) by Hot-Fit Model 2006: A Case Study of RSUD Dr Samratulangi Tondano, Minahasa Regency, North Sulawesi 202
Frendy Rocky Rumambi, Albertus Joko Santoso, and Djoko Budyanto Setyohadi

The Alignment of IT and Business Strategy at ROC Leeuwenborgh 208
Frederick Wonges, Jack Zijlmans, and Leo Willyanto Santoso

Development of Capability Assessment Model of IT Operation Management Process with Organizational Behavior 214
Luh Made Wisnu Satyaninggrat and Kridanto Surendro

Exploring Critical Success Factors of Mobile Learning as Perceived by Students of the College of Computer Studies – National University 220
Bernie S. Fabito

Identifying Characteristics and Configurations in Open Source ERP in Accounting Using ASAP: A Case Study on SME 227
Agung Terminanto and Achmad Nizar Hidayanto

Simulation and Virtual Reality Applications

The Real Time Training System with Kinect: Trainer Approach 233
Ivana Valentine Masala and Apriandy Angdresey

3D LIDAR City Model Application and Marketing Plan Development 238
Kevin Sanjaya, Frank Henning, and Kristo Radion Purba

Periodic Review Inventory Model Simulations for Imperfect Quality Items and Stochastic Demand 243
Gede A. Widyadana, Audrey T. Widjaja, and Irena Liong

Simulation on Crowd Mobility of Moving Objects Using Multi-agent and ClearPath 250
Baihaqi Siregar, Agnes Irene Silitonga, Erna Budhiarti Nababan, Ulfi Andayani, and Fahmi Fahmi

Truck Management Integrated Information System in a Shipping Line Company 257
Arnold Samuel Chan and I Nyoman Sutapa

Simulation of Atmosphere in Trowulan during the Golden Era of Majapahit Using Virtual Reality 263
Daniel Kusuma, Rudi Adipranata, and Erandaru

Development of Interactive Learning Media for Simulating Human Digestive System 270
Kristo Radion Purba, Liliana, and Daniel Runtulalu

Development of Interactive Learning Media for Simulating Human Blood Circulatory System 275
Kristo Radion Purba, Liliana, and Yohanes Nicolas Paulo Kwarrie

Smart Assistive Technologies

Fall Detection Application Using Kinect 279
Kartika Gunadi, Liliana, and Jonathan Tjitrokusmo

Driver Drowsiness Detection Using Visual Information on Android Device 283
Aldila Riztiane, David Habsara Hareva, Dina Stefani, and Samuel Lukas

Epileptic Alert System on Smartphone 288
Aziis Yudha Adwitiya, David Habsara Hareva, and Irene Astuti Lazarusli

Elderly Healthcare Assistance Application Using Mobile Phone 292
Andreas Handojo, Tioe Julio Adrian Sutiono, and Anita Nathania Purbowo

Socially-Enhanced Variants of Mobile Bingo Game: Towards Personalized Cognitive and Social Engagement among Seniors 297
Chien-Sing Lee, Shanice Wei-Ling Chan, and Sheng-Yee Guy

Smart Mobile Applications

M-Guide: Hybrid Recommender System Tourism in East-Timor 303
Jaime da Costa Lobo Soares, Suyoto, and Albertus Joko Santoso

M-Guide: Recommending Systems of Food Centre in Buleleng Regency 310
Komang Ananta Wijaya, Suyoto, and Albertus Joko Santoso

Empowering Public Secondary Schools on Disaster Response and Recovery: A Framework for the Development of Helpline Mobile Application 315
Odette Saavedra, Matthew C. Abrera, Mickaela Carla L. Waniwan, Curly Kale C. Dava, and Bernie S. Fabito

A Framework Mobile Game Application that Teaches Parts of Speech in Grade 3 in Filipino 321
John Erasmus Correa, Jastine Gamboa, Mark Edison Lavapie, Edzel Uy, and Ramon L. Rodriguez

iSagip: A Crowdsource Disaster Relief and Monitoring Application Framework 327
Auxesis Jacobi M. Schwab, John Eduard C. Omaña, Kent V. Roazol, Ted Anthony Y. Abe, and Bernie S. Fabito

Case Studies of Knowledge Discovery and Management

Executive Dashboard as a Tool for Knowledge Discovery 331
Nyoman Karna

Data Mining Applications for Sales Information System Using Market Basket Analysis on Stationery Company 337
Alexander Setiawan, Gregorius Satia Budhi, Djoni Haryadi Setiabudi, and Ricky Djunaidy

A Knowledge Management-Extended Gamified Customer Relationship Management System 341
Chien-Sing Lee, Jun-Jie Foo, Vinudha a/p Jeya Sangar, Pei-Yee Chan, Weng-Keen Hor, and Eng-Keong Chan

Web Based Customer Relationship Management Application for Helping Sales Analysis on Bike Manufacturer 347
Anita Nathania Purbowo, Yulia, and Agustinus Ivan Suryadi

Replenishment Strategy Based on Historical Data and Forecast of Safety Stock 353
Allysia Ongkicyntia and Jani Rahardjo

On Estimation and Prediction of Simple Model and Spatial Hierarchical Model for Temperature Extremes 359
Indriati Njoto Bisono

Author Index 363

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***Abstract*—The alignment of IT and business strategy plays important role to achieve company goals. Indeed, the business and IT performance are tightly coupled, and company cannot be competitive if their business and IT strategies are not aligned. ICT Lyceum ROC Leeuwenborgh tends to have IT strategic plan as a guideline to aligned between IT and business strategy. The main goal of this research is to make a recommendations for the new IT strategy implementation as a part of EA that can support the business goals. In order to create the recommendation, Strategic Information System Planning with Ward and Peppard method has been used. The internal (strengths and weaknesses) and external (opportunities and threats) factors of business and IT of ICT Lyceum have been analyzed based on Applegate L.M. perspective. The perspective contains 3 models analysis: Porter's Five Forces, McFarlan Strategic Grid, and Strategic Alignment. Afterward, the strengths, weaknesses, opportunities, and threats were put into a TOWS matrix in order to create the strategies options. Strategies options were being used to create the recommendations of information technology in hardware and software. The findings of the study show that ROC Leeuwenborgh perceive that alignment is important and can bring considerable benefits.**

Keywords*— *Alignment; IT strategy; IS Strategic Planning; Ward and Peppard; SWOT.

I. INTRODUCTION

Alignment between business and IT is a condition where the vision, mission, value, objective, and planning within business strategy are supported by IT. Achieving this stage has long been a critical issue for many organisations in the world.

The previous research showed the importance of alignment if organizational success is to be achieved [1, 2]. IT became seen to be a part of organisations [3, 4]. Small and medium enterprises (SME) also get the positive IT impact on organisational performance [5]. SMEs with high level of business-IT alignment indicate better performance than SMEs with low level business-IT alignment [6]. There is a positive relationship between business-IT alignment and organisational performance based on strategic perspective [7].

Nowadays, IT has become an important aspect of everyday business [8]. Business-IT alignment has shown to increase organisation profit and performance [9, 10]. It also improves the return on investment for Information Systems [11, 12].

ROC (Regionaal Opleidingen Centrum) Leeuwenborgh tend to improve their performance and profit. ROC Leeuwenborgh is an MBO education in The Netherlands which provides educational in CUvV (CIOS, Skin Care, Safety), education, Healthcare and Welfare, economic, and technology. Due to the students are in the range of 16 years old until 21 years old, this education is purposed not only teach them with knowledge, but also a place for them to grow, search, and build their identity.

On the other side, Information technology (IT) infrastructure lies at the heart of most companies' operating capabilities. Because ICT Lyceum, one of the departments in economy sector, which giving an IT education, depends on these technologies, no longer is IT simply nice to have; no longer is IT just value-adding. It has become vital.

From those two points stated above, there is similarity that can be seen as opportunities, where ICT Lyceum can provide the right IT infrastructure for their customers (students, teachers, and managements), ICT Lyceum can improve their customer's satisfaction. IT infrastructure can consist of seven sectors, which are: the hardware, the software, the data storage, the network, the internet, the integrated system and the operating system. When ICT Lyceum has a guidelines or strategies to be executed in the IT infrastructure, ICT Lyceum can also control its cost. The other point is that when ICT Lyceum can offer the newest technology, it can expand the market. The conclusion is that ICT Lyceum department wants to improve its IT infrastructure in hardware and software.

The output of this research is mainly to give recommendations of IT infrastructure support, such as hardware, software and network component to align the IT and the Business based on customer (students, teachers, and managements) needs to support the strategic company business goals. The deepest challenges of IT management are in understanding and assigning responsibility for making

these just not technical, not just business decisions, in bridging the gap between the business and technology domain.

The rest of the paper is organised as follows. Section 2 discusses the literature review that focused on business-IT alignment models. Section 3 describes the research methodology. The next section presents the results of the survey and discusses their implications. The final section concludes the paper and presents some suggestions for future work.

II. Strategic Information System Planning

Strategic Information System Planning is the procedure used to create a strategy. Strategic Information System Planning was chosen because it is giving an assistance for the company to identify and to align company's strategy with effective information systems to achieve company's objectives [13]. Ward & Peppard method is being used to make the Strategic Information System Planning. The method of Ward & Peppard can be seen in Fig. 1. In the Ward & Peppard method, there are business and information technology internal and external factors that need to be analyzed. Both factors are analyzed by using Applegate L.M. [14] perspective that can be seen in Table 1. The perspective also contains 3 model analysis: Porter's Five Forces, McFarlan Strategic Grid, and Strategic Alignment. For business factors, the analyzed is incorporated into SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis. Afterward, the SWOT analysis were put into a TOWS matrix in order to create the strategies options. Strategies options were being used to create the recommendations of information technology in hardware and software.

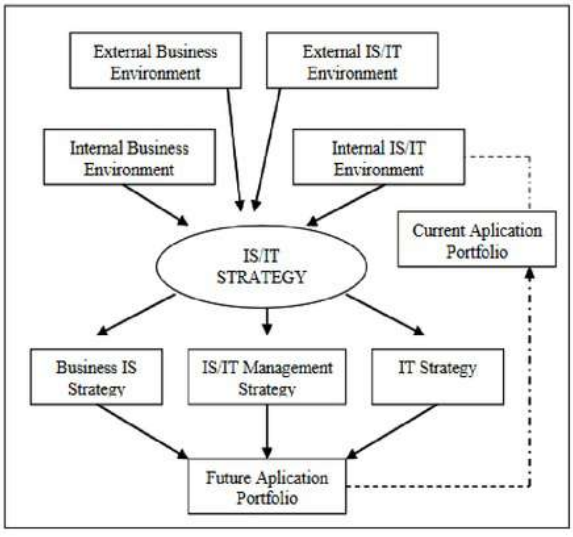

Figure 1. Ward & Peppard Method [13]

TABLE I. Applegate L.M. Perspective

Perspec-tive	Description	Factor	Analysis
1	IT and Strategy	Business	External
2	The organization as a case for IT		
3	IT and Organization		Internal
4	Infrastructure and Operations		
5	Organizing and Leading the IT Function		
6	A Portfolio Approach to Managing IT Projects		
7	Extending the Enterprise	IT	External
8	Internetworking Infrastructure		Internal

III. Methodology

The first phase of this research is initiation. This phase is to plan for the whole research workflow. Planning is essential to keep the research on the right schedule. Creating a research plan and gathering information about requirements of the research are done in this phase. The second phase is research. The research methodology is using DOT framework that can be seen in Fig. 2. The information will be gathered using 5 different methods which are: Library, Field, Workshop, Lab, and Showroom. The third phase is analyzing & writing. This phase is to analyze all the information that gained from research phase to make the recommendation of IT strategy. The last phase is delivery. This phase is to deliver the report that contain the recommendation of IT strategy.

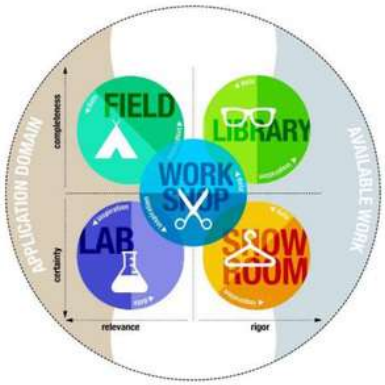

Figure 2. DOT Framework [15]

IV. Result and Discussion

The various observation based on perspectives in Table 1 are provided below.

A. Perspective 1: IT and Strategy

The various observations showed that ICT Lyceum offered the right courses at the right time on product

positioning. Information technology especially application and media are growing nowadays. The values to have based knowledge, self-learning and good motivation are leading. Therefore students can improve their knowledge by themselves in the future. The department also focuses on improving the IT environment especially in hardware and software to offer students the best possible service to feel the IT world.

Because of the education level is in the middle range, the market of students are wide enough. Furthermore, with collaboration with education below this range, the department can more easily reach the students. However, entering a technology sector, there is a problem when ICT Lyceum can not provide the great and the updated technology for their students. Offering the great and updated technology offers an opportunity to generate new revenue from new and existing students.

A second opportunity that flows is able to supply enough hardware, especially on laptops or PCs to the low-economy students. By owning sufficiency PC or laptops, students can be offered better service. The students can spend their money to buy another IT stuff rather than only to buy the expensive laptops to reach the requirement of the software. The focus of the students is not to strategic level, but the operational and managerial level of work. There is no possibility for ICT Lyceum to teach students to work at the strategic level because it is for a higher range of education.

The observation revealed that the company is working to improve the IT hardware and software in consideration of business needs, cost and efficiency. IT provision in ICT Lyceum is removed by ICT Lyceum itself. This IT provision is thus a provision which is taken by both students and teachers demand. Within the strategic grid is seen as a logical route to ultimately to the strategic quadrant. It should be noted that IT remains within the factory quadrant, but that information was then given the opportunity to develop from factory to strategic. The transition of IT to the factory quadrant is, therefore, essential to take the next step with information.

The observation shows that the company operates a business inside the chain in order to run the education in information technology sector. The business strategy act as the driver of the company and the IT field is involved in supporting the business. However, the business strategy is not 100% truly drive the infrastructure and the processes. The IT field has not chosen the infrastructure and processes, but IT field mentioned it. Therefore, high cost appears as a problem because the business field does not know exactly every year what the IT will be.

Having an IT strategy, the company could be known at least the general and the concept of the IT infrastructure and processes each year. Also, it gives benefits for both business field and IT field. On the business side, control cost could be done. On IT side, estimate the strategies are right or not could be done.

B. Perspective 2: The organization as a case for IT

The observation revealed that ICT Lyceum focused on improving leverage infrastructure to support the business. The goal is to improve the hardware network and computers which are used for examination by students. Likewise, improving the software to easier both students and teachers in both grading and survey the teacher. Besides, to make the possible transition of support and factory quadrant to strategic quadrant. The fact is a lack of time and people to realize the strategic. The result is the strategic need to be reevaluated to make sure that it is still needed in that time.

C. Perspective 3: IT and Organization

The internal customer which is teachers need to work together. This is a huge problem because teachers are the customer who mentioned the IT things to run the business. There are 2 possibilities to solve the case by scheduling them to discuss the IT things in the department or create one small group consisting of 3 people which focus on analyzing and improving the IT infrastructure regularly. The fact is teachers are very busy when scheduling them to think about the IT infrastructure, they will have a double job which is why to create one small group to audit the IT infrastructure at ICT Lyceum is the best choice.

D. Perspective 4: Infrastructure and Operations

The observations show that ICT Lyceum's data center has physically housed in the same building of the department. The data center is owned by ICT Lyceum department. Every worker can access the room because it has the same lock key as the other door. The only one ICT Lyceum control for the data center is about the temperature of the room which about 21-degree Celsius.

E. Perspective 5: Organizing and Leading the IT Function

The observations at ICT Lyceum shows that the department mainly in user dominance side. User controls the IT to run the business is the main factor ICT Lyceum goes to this side. The department also needs the IT to run their business, in another word it is fit with the company. However, managerial level wants to control the cost of the IT infrastructure. Having a central data center which connecting both ICT Lyceum locations (Sittard and Maastricht) will improve the business. Both user dominance and centralized IT structure are needed for the company, but the need is a different time. The system is based on customers demand and need to be centralized by the IT structure. The result is ICT Lyceum still work on to control the cost, making connected locations and ensuring the needed system.

F. Perspective 6: A Portfolio Approach to Managing IT Projects

The observations at ICT Lyceum shows that the company after implementing projects, the department needs to prove the positive result to the strategic level. There is no

use of certain types of project management tools that are tailored to the type of project undertaken. The projects are not planned in the framework of a program. In carrying out the project using a traditional model based on the system development life cycle (SDLC). Adaptive methods are not used. Can be inferred from the observations that the project in ICT Lyceum department is totally guided by Mr. Chris Vrolings. This is a good step that may decrease the inaccuracy time, cost, and inefficiency during the execution of projects.

G. Perspective 7: Extending the Enterprise

The observations at ICT Lyceum shows that the department is in line with the development of technology by providing lessons in the field of mobile, especially in mobile application. In term of size, there is nothing to worry because the hardware (server, router, and PC) to run their business already has their own space. In software field, there has been a software for data storage based on web service.

H. Perspective 8: Internetworking Infrastructure

The observations at ICT Lyceum shows that the department uses some specific software such as Fronter to view schedule, Outlook e-mail, and attendance system. Supporting software also used in terms of learning such as Microsoft Office, CISCO, VM Ware, etcetera. For the hardware, the intended Server is only for Local Area Network (LAN) and only 1 unit using 2x Intel Xeon, 164GB RAM. The 20 Personal Computers (PCs) are available for use by students. The specifications of the PC are Pentium® Dual-Core CPU E5400 (2.7GHz, 2MB L2 cache), 4GB (2x2GB) DDR2 800 MHz SDRAM Memory.

The strengths, weaknesses, opportunities, and threats (SWOT) analysis are provided below in Table 2.

TABLE II. SWOT ANALYSIS

Strengths	Weaknesses
1. There are 2 locations: Sittard and Maastricht. 2. There is a simple network which can be easily upgraded. 3. There are a lot of technical teachers which understand IT and network. It is easy to build and improve the IT infrastructures by itself. 4. ICT Lyceum department can build their own structure separate from the company (ROC Leeuwenborgh).	1. Data center less secure because the lock key has same as the others doors. 2. There is no specific IT group in ICT Lyceum department which analysis and audit the IT environments. 3. There is no specific planned when company examination projects. 4. Still working on having centralized IT structure which can be analysis and estimate the cost.
Opportunities	**Threats**
1. Offering education at the right time, IT, which means the market is growing. 2. There is an opportunity to work together with a lower and higher education (VMBO & HBO). 3. A chance to improve the environment with the existing technology. 4. A specific field of education. Only focus on educating people in the operational and managerial level.	1. The market will loss when can not provide the right and existing technology. 2. Information technology moves to strategic quadrant which improves the risk of missing time. 3. Information technology growing rapidly which need to look for demand frequently. 4. Rapid demand changes and no IT strategy cause a higher cost.

TOWS Matrix of ICT Lyceum is shown in Fig. 3. The cross sign means that both options can help each other and be a strategy. By connecting each cross sign of TOWS Matrix, the strategic options, the related quadrant, and term to the strategic options of ICT Lyceum can be seen in Table 3.

TOWS	Strengths	Having 2 locations	Upgradable network	Having Technical teachers	Possible to build own structure	Weaknesses	Less secure of data centre	No specific IT group	No specific planned of project examination	Working on centralized IT structure
Opportunities										
Market is growing		X								
Working together with lower and higher education										X
Possible to improve the IT environment					X		X			
A specific field of education			X					X		
Threats										
Possibility to loss the market		X								
Risk of missing time				X					X	
Frequently looking the demand										X
Higher cost			X				X			

Figure 3. TOWS Matrix

TABLE III. STRATEGIC OPTIONS

No.	Strategic Options	Quadrant	Term
1	Connecting both locations, therefore it is possible to increase the market.	SO	Short
2	Maximizing both locations to reduce the possibility of losing the students.	ST	Short
3	Upgrading the network based on the courses that ICT Lyceum offered to support the lessons.	SO	Medium
4	Building the hardware and software of ICT Lyceum. It is possible to run separate systems from ROC Leeuwenborgh.	SO	Medium
5	Improving the standardization of data center to improve the quality and security of data center.	WO	Medium
6	Working together with other education to build centralized IT structure.	WO	Medium
7	Upgrading the network using a high cost at the beginning. However, it lowers the cost in the future by using the network for at least 3 years.	ST	Medium

8	Improving the security of data center to prevent the more cost.	WT	Medium
9	Using the teachers which have experience in auditing IT. It is better to have a separate group of IT which focus on improving, auditing and analyzing routinely.	WO	Long
10	The risk of missing time can be reduced by coordinating teachers when examination projects, therefore project done faster.	ST	Long
11	Using the plan to examination project to prevent the risk of missing time.	WT	Long
12	Using IT centralized structure to control the demand.	WT	Long

Using the strategies options in Table 3, there are three (3) area recommendations: the hardware, the system, and the network scheme.

The recommended hardware can be seen below in Table 4. The proposed laboratory scheme and monitoring system for each computer, each computer will able be monitored and controlled via a central computer.

TABLE IV. RECOMMENDED HARDWARE

Type	Category	Units	Specifications
Server	Application Admin	4 4	2x Intel Xeon E5-2690 2.9GHz Octa Core, 384GB (24x16GB) RAM, SAS 3T 15K 12G (10x300GB)
PC	Laboratory	20	Intel Quad-Core i7 CPU with Intel Iris Pro graphics (2,6 to 3.5GHz Turbo, 6MB cache), 32GB (2x16GB) DDR4, 500GB SSD M.2 (2x250GB)

The recommended system mapped using McFarlan matrix can be seen below in Table 5.

TABLE V. RECOMMENDED SYSTEM

Strategic	High Potential
Library system Online Survey system	"LinkedIn" system
Key Operational	**Support**
Grade system	Monitoring system Authenticity system

The recommended network scheme can be seen below in Fig. 5. It is better if the routers and the firewall are supplied by Vancis' company rather than ICT Lyceum due to ICT Lyceum is understaffed to maintenance it. The firewall is used to filter and block certain websites and programs. To make it easier when upgrading or maintaining, each category of the server has its own port. Each category of the server should have at least 2 servers in each location to run back-ups. Both locations are connected using virtual local area network (VLAN). It has its own advantage, the servers can be controlled from the other location.

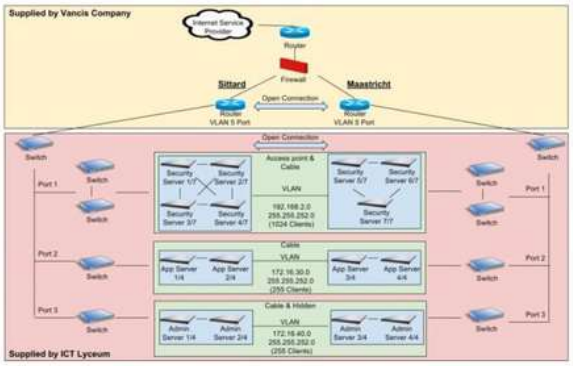

Figure 5. Recommended Network Scheme

By using the Table 5, a sequence of implementation plans can be seen in Fig. 6. The implementation plan starts from the Key Operational, followed by Strategic, High Potential, and Support. Connecting Sittard & Maastricht in term of the network is the first thing to prepare due to the significant positive impact on the business side.

The short term of the strategic option is to maximize ICT Lyceum strengths by connecting ICT Lyceum at Sittard and Maastricht and increasing the speed of internet connection. This activity gives ICT Lyceum the same facility on both locations that means ICT Lyceum will have more rooms. ICT Lyceum also will able to run the examination in both locations. Besides, the further impact is to help ICT Lyceum accepting more students.

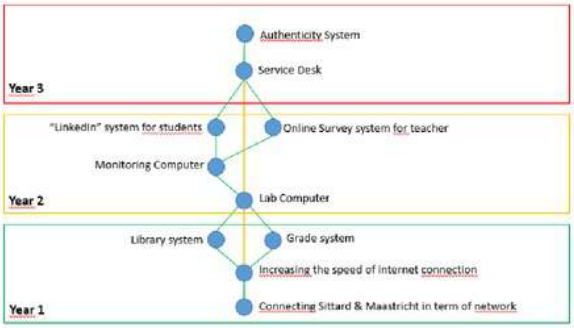

Figure 6. Implementation Plan

The medium term of the strategic option is to maximize ICT Lyceum opportunities by building the hardware, and the software to support the examinations, the projects, the lessons, and the future systems. Building the hardware refers to making servers, making laboratory with monitoring feature, and improving the standardization of the data center. The systems that are needed to build are a grade, library, "LinkedIn" for students, and online survey for teachers. The development of the systems also supported by the students. Authenticity software also needs to make sure the validation of the student work. Using this development

plan, ICT Lyceum has a chance to work together with other institutions that do not have those systems. Besides strengthening the relationship, it also reduces the production cost of making those systems. By trying to provide complete facilities, ICT Lyceum gives a chance for students to feel the atmosphere of the education before they decided to take an education. On the other hand, ICT Lyceum has a higher chance of working together with other companies and get more project to be done by students. All of these developments should be maintained by insourcing.

The long term of the strategic option is to minimize ICT Lyceum threats by coordinating the teachers to use specific guidelines for examining project so that reduce the risk of missing time and the project will be done faster. By having coordination, it will help teachers to cooperate together. The other strategic option is by creating an independent small group that focuses on improving and auditing the information technology. Therefore, teachers will not have a double work and can continuously improve the information technology infrastructure.

V. Conclusion

The recommendation for the IT strategy implementation that can support the business goals is available. The IT strategy implementation ready to be used by ICT Lyceum to help the department reach its business goals and answer its business needs.

There are 3 recommendations for further research: (1) competitor internal and external analysis, (2) the impact of teachers' working space for their career, and (3) the whole audit of ROC Leeuwenborgh IT infrastructure.

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