



# Design of E-Portfolio to Enhance Career Development for TVET Graduates

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**Abstract:** Technical and Vocational Education and Training (TVET) is an education sector that prepares individuals with the skills required by the industry to improve the individuals' employability and competitiveness as workforce at national and international levels. The use of information technology as education technology in TVET supports the integration of technological advancement with TVET components in order to assure the compatibility between the graduates' skills and the industrial needs. E-Portfolio as one fruit of the advancement of knowledge and technology offers a new solution to improve the absorption of TVET graduates as the workforce into the industry. The usability of E-Portfolio is determined by the design of E-Portfolio development that should describe the skills and competences of the graduates more precisely to the industry with an expectation to increase the absorption of the graduates into the employment world. E-Portfolio in this article is designed using website-based technology that is supported with four features, namely Portfolio Insight, Portfolios, Portfolio Journey, and My Library. Navigation support system is included in the design of E-Portfolio and becoming innovative in portfolio development stages. The navigation support system takes a form as the textual guidance in the media users choose to exhibit their learning evidence.

**Keywords:** E-Portfolio, career development platform, web application, innovation technology, system development, TVET innovation, education technology

## 1. INTRODUCTION

Education is one of priority systems that need to be improved to maintain not only its quality but also its capacity in supporting human resource-based economic activity. One education sector with this kind of role is TVET [1].

Regarding the statements above, TVET is an education sector that prepares individuals with the skills needed by the industry with an expectation that this skill preparation improves individuals' employability and competitiveness as workforce at both national and international levels [1][2][3]. Workforce becomes a fundamental problem in any business and economic activities at least because the competition of employability often requires workforce to have innovative capability in delivering products [2][3][4]. Taking this matter into consideration, TVET is aimed to support the industry by providing ready-to-work graduates for industrial requirement. The industry might need TVET graduates not only for their applicative capability but also their their capability in developing products with innovative value [5].

Nowadays, TVET encounters a problem concerning workforce unemployment indicated by low absorption rate of TVET-based workforce into the industry [6]. Main reason behind this problem is the impact of industrial revolution

which causes the incompatibility between the skills of the graduates and the skills required by the industry [4][6].

The use of education technology in TVET could support the integration between technological advancement and TVET components (consolidation of education role, learning concept and facility) [7]. Education technology gives a certainty to the industry that the skills mastered by the graduates is compatible to the industrial requirement [7].

Moreover, education technology also helps TVET to improve the skills of the graduates and also develop graduates' capability in transferring their skills into the industry [7]. The expected outcome is the closer collaboration of skills between learners, institutions, employers, and government.

In addition, education technology gives opportunity to the industry to know more about skills and competences of TVET workforce. The education technology intended in this context is electronic portfolio system (E-Portfolio) [7]. This technology allows TVET to determine and measure the skills and competences of workforce more precisely [7].

E-Portfolio could show the learning outcomes instantly [8]. That is why this technology supports the interaction



of social environment inside the organization. The graduates learn their progress, do learning together, and share their learning evidence [8][9][10]. Also, E-Portfolio gives feedback or results of reflection (concerning achievement or quality standards) when internal or external parties are assigned to conduct review and monitoring [11]. Indeed, the presence of E-Portfolio is an indication that the development of knowledge and technology could offer new solution to TVET to increase the absorption of workforce into the industry [11][12].

Previous studies seemed supportive to the use of E-Portfolio for career development of the graduates [13]. Several studies asserted that to increase employability, a portfolio could be used as an instrument that supports the preparation of the graduates for the industrial world (along with planning and training) [13][14][15]. One variance of this portfolio is E-Portfolio that emphasizes on skills and competences. Other studies discovered that the making and the use of portfolio are proven to be useful in preparing TVET graduates to enter the industrial world [16].

Another studies confirmed that portfolio is an instrument that helps the graduates to seek for job and also is an effective resource for their professional development [17]. The graduates of TVET could use portfolio to prove their learning outcomes to support their employability because portfolio provides a description of their experiences, skills and competences [17][18][19]. Portfolio might be used by the industry for justification because not all TVET graduates have same quality of skills and competences [3][20]. Similarly, TVET graduates might need to use portfolio that describes their skills and competences in order to be justified by the industry [2].

Potential usage of E-Portfolio as an instrument that displays skills and competences to support graduates' career development is determined by the design of E-Portfolio [21]. Correspond to this statement, the design of E-Portfolio surely influences the presentation of contents that describes skills and competences of the graduates [21]. Previous studies clarified that any error in the design of E-Portfolio could have serious consequences [21][22]. For instance, poor design of E-Portfolio could obscure the intention of the user. The monotonous contents of E-Portfolio are usually not worthy to be read. Wrong design could make the information in E-Portfolio less structured, which definitely increases the possibility of failure [21][22].

Other reasons of unfavorable E-Portfolio design are chaotic and puzzling sentences, too many contents and information that are not relevant, different format for portfolio that could confuse the user, and difficult procedure in operating E-Portfolio system, which could influence user convenience [21][22].

Mostly, the design of E-Portfolio emphasizes on the presentation of contents that comprise of learning outcomes and description that supports these results. The contents

must be properly integrated in order to provide accurate description of skills and competences of the graduates [22]. Previous studies declared that descriptive support might be the weak point of E-Portfolio dependability. E-Portfolio that does not include descriptive support would lack of details on graduates' competencies, which might cause mistake during evaluation [21]. Further mistake in descriptive content could make the function and intention of E-Portfolio less effective [21].

This article gives an elaboration concerning the design of E-Portfolio for TVET graduates. The reader of this article would be informed about how to fill the contents of learning outcomes and develop descriptive support. Specific guidance for descriptive support is provided to delimit information scope and to facilitate information transfer in clearer and more accurate ways.

## 2. RELATED WORK

This section explains several literatures that support the use, development, and utilization of electronic portfolio system for career development and also elaborates the literatures that concern with the relevancy of this system to industrial sector as the stakeholder.

### A. The Benefits of Using E-Portfolio for Career Development

Electronic portfolio system can be recognized by type and purpose of development [23]. The knowledge about this classification may help the user to reduce the weakness of E-Portfolio. Based on the type and purpose of development, E-Portfolio is differentiated into three [23]. First is portfolio for learning [23]. Second is portfolio for assessment [23]. Third is portfolio for career [23]. E-Portfolio for learning is often used at the education realm as a part of curricula to make easier the reflection process in learning [23]. Multi level program in E-Portfolio for assessment is usually arranged to display the competency level of the individuals [23]. E-Portfolio for career is used to demonstrate skills and competencies possessed by the industry as the indicator for career identity and career achievement [23][24].

As a potential instrument also used for career development, E-Portfolio prepares the individuals with the context of skills and competencies that are required during industrial recruitment process [13]. Also, E-Portfolio is the instrument used to prepare the high school graduates for their career by giving greater opportunity to enter industrial world because the graduates are supplied with insights on the maps of skills and competencies needed by the industry [13][15]. E-Portfolio could adjust the different potentials of the individuals to the industrial demand and recognize the potentials that should be developed [15].

Using E-Portfolio, the individuals could present more information concerning their potentials to the industry. The expectation is that the industry is able to evaluate the individuals more comprehensively and able to differentiate the skills and competencies of different individuals.



In the perspective of personal development, E-Portfolio helps the individuals to understand the compatibility between their potentials and the demand of workplace. On the one hand, E-Portfolio helps the individuals in developing long-term plan for their career. In the other hand, the industry would be facilitated by E-Portfolio in examining the development of individual capabilities. Through E-Portfolio, the industry would be easier to learn the soft skills and personality of the individuals and later to compare them to the corporate background. So far, one point that needs to be underlined is that E-Portfolio is excellent in presenting the learning outcomes from the individuals which represent their possible contribution to the industry.

E-Portfolio for the purpose of career development would integrate all individual capabilities into the possible online media that later allow the industry to get information regarding relevant skills and competencies by only typing keywords in search engine. Moreover, E-Portfolio enables the individuals to share portfolio in various social media to capture more extensive audiences.

Previous studies concerning the effectiveness of E-Portfolio in recruitment process pointed out that E-Portfolio is rated with a high value for the capability in evaluating individuals as a part of recruitment process [17]. Small and large industries that recommend the usage of E-Portfolio in recruitment process is 98% [17]. E-Portfolio provides a structure that enables the graduates to exhibit their learning outcomes as their academic and professional experiences [17].

Other studies on the effect of E-Portfolio for career deliver various results [20]. The graduates that agree if E-Portfolio helps them in displaying skills and competencies through the principle of sharing and reflection are 60% [20]. Meanwhile, the graduates that believe if E-Portfolio enables them to identify the compatibility of their professional capability to the industrial demand are 56% [20]. Next, the graduates that assure if E-Portfolio allows them to reflect their professional capability are 38% [20].

Another studies regarding E-Portfolio for the recruitment process revealed the implication of E-Portfolio on the interview [24][25]. In general, E-Portfolio could assist the graduates to understand what needs to be presented in recruitment process.

The graduates should thank to E-Portfolio for the direction given to them in selecting skills and competencies required by the employment world [24]. E-Portfolio increases the mobility of graduates in seeking for jobs which therefore makes E-Portfolio also helpful in reducing possible unemployment.

In the perspective of individual or of industry, the use of E-Portfolio to demonstrate the graduates' capability in recruitment process has several benefits [24].

The benefits of using E-Portfolio for career development and recruitment process of high school graduates are presented in Table I and II [13][15][17][20][24][25].

TABLE I. BENEFITS OF USING E-PORTFOLIO FOR CAREER DEVELOPMENT AND RECRUITMENT PROCESS

No	Topic	Explanation
1	Hiring Process	<ul style="list-style-type: none"> <li>E-Portfolio is commonly used in the recruitment process as a base for industry evaluation, which is the continuity of interview process.</li> <li>As a consideration for the industry despite the various potentials.</li> <li>In long-term, E-Portfolio can be used to predict which areas and positions will be developed by the industry in the future.</li> </ul>
2	Timing	Being able to summarize the steps of recruitment, an E-Portfolio makes the recruitment process more efficient and time saving.
3	Recognizing Personal Nature	<ul style="list-style-type: none"> <li>To assess the individual's personality and suitability for the industry.</li> <li>To explain an individual interest in a specific field's experience.</li> </ul>
4	Connecting	Could serve as an online media inventory and digital media integration.
5	Accessibility	Facilitate the industry's easy access to potential employees.
6	Flexibility	Individuals do find it easier to adapt to online systems that are used privately by the industry.

### B. Criteria of E-Portfolio Contents

This section elucidates the criteria that must be met in E-Portfolio for career development. The recommended criteria would be considered as E-Portfolio features that emphasize on the description of skills and competencies. Previous studies (in Table III) on various fields are the source of these criteria. Later, the developed criteria in the article are the adaptive criteria that are adjusted to the conditions of TVET graduates.

In this article, the development of E-Portfolio is grounded in three areas that are related to each other in a collaborative way. Apart from those three different but related areas, E-Portfolio still focuses on providing

TABLE II. BENEFITS OF USING E-PORTFOLIO FOR HIGH SCHOOL GRADUATES [11][13][15][25][26]

Recommended Use of E-Portfolio for Industry	Advantages/Benefits
<ul style="list-style-type: none"> <li>• Application</li> <li>• Initial shortlisting/screening</li> <li>• Interview</li> <li>• Distinguish between candidates/ final decision</li> <li>• Unclear best time to use in recruitment process</li> </ul>	<ul style="list-style-type: none"> <li>• It facilitates identifying one candidate from another.</li> <li>• Efficient time to evaluate candidates</li> <li>• Simplicity in the ease of storing, accessing, sharing and retrieving information</li> <li>• Demonstrates creativity skills/technology</li> <li>• Demonstrates organizational skills</li> <li>• Provide more candidate comprehensive assessment</li> <li>• Demonstrate the ability for candidate (provide additional information)</li> </ul>

description of skills and competencies of TVET graduates. These three areas are (1) background development area, (2) experience learning area, and (3) evaluation and decision area. Each area will be explained in Table IV.

What makes E-Portfolio in this article different and superior from other proposed E-Portfolio is on the strong emphasis on the contents. Precisely, E-Portfolio system in this article must be able to help the graduates to develop their learning outcomes, prepare the evidence, and describe the evidence as their achieved competencies. Other E-Portfolio systems have flaw in describing learning evidence, which thus causes an error in the evaluation done by stakeholders. Any mistake in the description is enough to make the function and purpose of E-Portfolio to become ineffective.

Learning evidence inserted into E-Portfolio system is usually followed by the description concerning the evidence. The location of this description is clearly shown in each stage of E-Portfolio development.

Each area that underlies the development of E-Portfolio for the career development of TVET graduates is elaborated in Table V.

### 3. ENVIRONMENT AND DEVELOPMENT TOOLS

Electronic portfolio system is a web-based system with the main task emphasized on developing and presenting portfolio in digital and document forms. In relation to this article, this system is used by two users, respectively TVET graduates as primary users and external users as secondary users. Primary users are identified through authentication process and usually doing activity through the main feature of the system. Secondary users are not identified by authentication process and only giving feedback in the form of comments and rating to the portfolio developed by primary users.

In the context of E-Portfolio development, secondary users are the stakeholders, precisely industry sector in general and informatics industry in particular. Secondary users could also be classified as the viewer of E-Portfolio system.

Tools are used in developing E-Portfolio system. Table V gives explanations about these tools.

#### A. System Limitation

Electronic portfolio system that is developed and explained in this article has limitation regarding the formulation of contents that describe skills and competencies. Despite this limitation, stakeholders could still conduct evaluation and reflection in electronic portfolio system to ensure the compatibility between the graduates' skills and competencies and the work requirements.

However, stakeholders might only receive the description of skills and competencies provided by the graduates. For example, if the content of experience learning presents information only about skills and competencies on informatics, then stakeholders only get this kind of information. More elaboration on informatics, which is intended in this article as an example, are referred to Figure 6.

### 4. SYSTEM ARCHITECTURE

E-Portfolio framework system has been designed in three work areas that could be run systematically by users. This system would meet the needs of users for career development that suits to their skills and competencies. Figure 1 shows E-Portfolio framework system for TVET graduates in detail, which skills and competencies are presented as output.

Figure 1 explains E-Portfolio system operated by TVET graduates as users to fulfill the needs of stakeholders concerning graduates' skills and competencies. Information in this system are managed through three areas, namely background description, experience learning, and evaluation and decision. Users must fill in the information about their background, which is indeed the main information in portfolio development. Following this process, the system put this information into background description area. Then, users fill in the information into experience learning area

TABLE III. CRITERIA OF E-PORTFOLIO FOR CAREER DEVELOPMENT

Researcher	Field	Developed Criteria
Weber (2018)[13]	Engineering	Executive Summary; Accessible Resume; About me; Academic Experiences; Professional and Project Experiences; Research, Leadership, and Service Information; References.
Fowler (2012)[26]	Engineering	Convenience; Accessibility; Portability; Video.
Hartwick and Mason (2014)[27]	Education	Convenience; Accessibility; Portability; Video.
Wakimoto and Lewis (2019)[20]	Education	Sharing; Reflecting.
Ring, Waugaman, Brackett (2017) and Leahy, Filiatrault (2017) [24][25]	All Subject	Cover Letter; Resume; Link, Reference; Letter of Recommendation; Transcripts.
Mgrabi et al (2022)[28]	Education	Visibility Data; Personal Information; Professional Information.
Jose (2017); Samardzija and Balaban (2014); Shroff, et al (2014); Ring, Waugaman, Brackett (2017) [8][24][29][30]	All Subject	Personal Development Plan; Career Development Plan; Skill Activity Management; Competency Activity Management; Pedagogic Activity Management.
JL. J. Mitchell, C. Campbell, R. Rigby, and L. T. Williams (2021) [15][31]	All Subject	Sample of Work; Demonstration of Skills; Personality.
S. Al Idrus, A.P. Wibawa, H.W. Herwanto, M.W.R Fauwaz, and F.S. Ahmad (2021) [32]	Vocational Subject	Profile; Gallery; Portfolio.
Carleton University (2023)[33]	All Subject	Cover Letter; Resume; Education Background; Project.
Blackstone Valley Vocational Regional School (2023) [34]	Vocational Subject	Cover Letter; Resume; Profile; Artifact Presented; Description; Career Interest; Career Action Plan; Certifications; Distinctions.

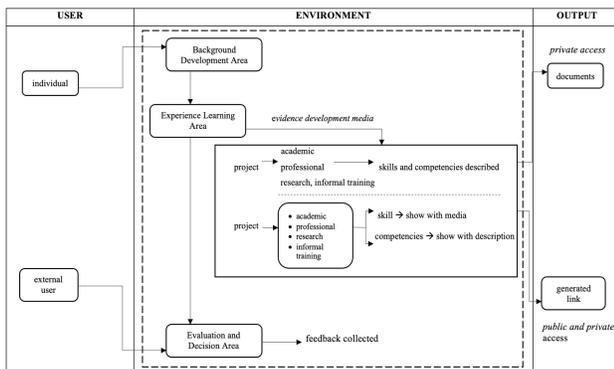


Figure 1. E-Portfolio framework system

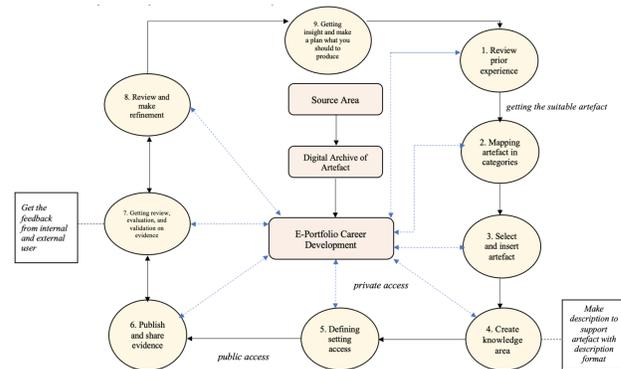


Figure 2. Stages of portfolio development[35][36][37][38]

concerning their education experience and also their experience out of their education expertise. Users provide learning evidence that shows any project done by users, which the project has been categorized by academic, professional, research and informal training. Specific media are used by users to fill in the learning evidence together with the description of relevant skills. The media also enable users to produce description or explanation concerning their skills and competencies. Users have privilege right to access the portfolio that has been made through the system. The access

is differentiated into two, respectively for private access as users' personal archive and for public access to be shared to external users. Indeed, users could share their portfolio to external users in form of document or link.

In return, external users give feedback after seeing portfolio shared by users through their public access privilege. Feedback becomes an evaluation for the portfolio which could be used by users as self-reflection for improvement.

Experience learning area contains the detail and sys-



TABLE IV. ARE UNDERLYING E-PORTFOLIO FOR CAREER DEVELOPMENT

Area	Explanation	Feature
Background Development Area	This part allows the user to define what belongs to him to support the information intended for the employment.	<ul style="list-style-type: none"> <li>• User description</li> <li>• Skills</li> <li>• Work Experience</li> <li>• Education</li> <li>• Interest</li> <li>• Social Media</li> </ul>
Experience Learning Area	This part should be where users will generate evidence to demonstrate their skills and competencies. This part consists mainly of evidence, storytelling, and evidence publication.	<ul style="list-style-type: none"> <li>• Project Journey</li> <li>• Artefact Categories</li> <li>• Upload Artefact</li> <li>• Artefact Storytelling</li> <li>• Setting Access</li> <li>• Generate Link Share</li> <li>• Generate Document</li> </ul>
Evaluation and Decision Area	This part serves internal and external user to validate the evidence that has been published. This part also provides the basis for review, refinement, insight, and future planning.	<ul style="list-style-type: none"> <li>• Rating</li> <li>• Comments</li> </ul>

tematic parts of E-Portfolio development process. Figure 2 displays the stages of portfolio development that users must work on.

Users undergo stages of process in developing portfolio, as indicated in Figure 2. In this article, the stages of process only prevail for the development of E-Portfolio system for TVET graduates for the purpose of career development. Each stage is elaborated as follows: First stage : users check their learning evidence after completing their learning process. Second stage : users map their learning evidence based the category in Figure 1. This stage guides the users in choosing their job and career. Third stage : users select and enter the learning evidence. This stage is done by uploading media that explain skills. Fourth stage : users create description or explanation for their learning evidence. The description is intended to explain skills and competencies. Fifth stage : users determine information scope in portfolio.

TABLE V. TOOLS FOR DEVELOPING E-PORTFOLIO SYSTEM

Tools	Utility	Explanation
Visual Studio Code	Back-end	This utility is used as IDE (Integrated Development Environment) for generating codes for the applications.
Node Js	Back-end	This utility is used like a library in JavaScript module to help simplify the development of web applications.
XAMPP	Back-end	This utility is used as web server in the development stages of applications. XAMPP could also be used as local server to support various operation systems.
API Algorithm (Application Programming Interface)	Back-end Algorithm	This utility is used to communicate the data between client and server, which the data are presented with API concept. In other words, this algorithm is used to communicate the data between back-end and front-end.
Sequential Searching Algorithm	Back-end Algorithm	This utility is used to search the data at E-Portfolio feature.
MySQL	Database	This utility is used to make the database that could modify and store the data, and also determine the relation of tables in applications. MySQL could also be functioned as intermediary between database and front-end in API concept using JSON's data format.
Figma	Front-end	This utility is used to develop the design of wire-framing and mockup in E-Portfolio applications.

Private access is for users' personal archive whereas public access is for external users. Sixth stage : learning evidence is exhibited to external users. Seventh and eighth stages : users perform self-reflection based on feedback derived from evaluation done by external users on learning evidence presented for public. Ninth stage : users prepare the next plan for developing new learning evidence.

All the stages above are systematic process that users

must undertake to develop learning evidence and also to plan for the development of the next learning evidence.

## 5. SYSTEM DESIGN

### A. Demand Analysis

In the context of this article, job/work is defined as the activity of social community that produces economic income for individual, group and nation. There are many jobs related with education but the article emphasizes on TVET because this kind of education involves skills and competencies. TVET graduates are in the high risk of being unemployed when their skills and competencies could not be used as data source to get any job in the industry. In modern world, technological support in education initiative is one of innovative capacities that could help any educational institution to develop human resources that could be absorbed as workforce through recruitment process. E-Portfolio is a technology that helps the graduates to present their skills and competencies, which then this presentation would be seen and measured by stakeholders without time limitation.

E-Portfolio developed in the form of job document usually contains information about skills and competencies. This arrangement allows the graduates to plan and manage their career development faster. Indeed, E-Portfolio system in this article is intended to be an instrument that enables the graduates to perform self-reflection concerning their skills and competencies. This is said so because the system is equipped with multimedia components that could demonstrate and explain the graduates' learning evidence that show their educative and non-educative experiences.

Besides, E-Portfolio also becomes a strategy to increase the employability of TVET graduates into the industry by allowing them to demonstrate skills and competencies at personal and professional scopes that stakeholders could evaluate.

### B. Main Function of the System

Main function of electronic portfolio system is generally to develop portfolio electronically, to archive and disseminate the portfolio, and to put the portfolio in display to be presented on audiences.

Following up the discussion in this article, main function of electronic portfolio system would be to create portfolio in electronic platform, to make corrections on the portfolio, and to disseminate the portfolio to the greater audiences. The making of portfolio must emphasize on the description of skills and competencies. This emphasis will be explained further in the section of portfolio feature.

The making of electronic portfolio must comply with the structure provided by the system. This structure associates with the emphasis on skills and competencies. Figure 3 illustrates how the stakeholders acquire the description of skills and competencies through the system. Figure 3 also depicts the main function of the system in relation with

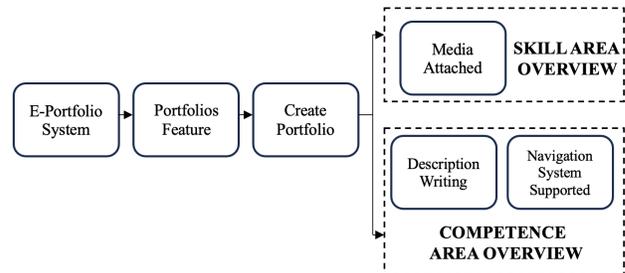


Figure 3. Description of skills and competencies in electronic portfolio system

development, archiving, dissemination and display of the portfolio.

## 6. SYSTEM IMPLEMENTATION

### A. Main Interface Design of the System

Referring to the statements in Section 5.2, the function of E-Portfolio in this article is only concerning with the development of portfolio.

Portfolio development in Clientzone Module is supported by four features, which so far are considered as user friendly. First feature is Portfolio Insight, which facilitates the users to see data recordings on any activity in their portfolio. Second feature is Portfolios in which the users could arrange their skills and competencies in certain configuration. This feature provides the description concerning skills and competencies that users have entered in the structural stages of portfolio development. Next, third feature is Portfolio Journey, which is an overview of all portfolios developed by users. Fourth feature is My Library, which is a place to store the users' learning outcomes. Users could keep in their learning outcomes in the form of picture media that represent the result of their learning experience

### B. Portfolio Insight Feature

Portfolio Insight is a feature in electronic portfolio system that is functioned to see the data records of users during the operationalization of portfolio in the system. But, this feature could only be owned and opened by the users when the users need to monitor the presentation of information in real time and also to read the information fast.

Any general information about portfolio document could be monitored through Portfolio Insight feature. Number of views, likes, comments, and share regarding portfolio document prepared by users would be shown in detail. The feature also provides graphic visualization to facilitate the monitoring, which allows users to keep track on the increase and decrease of responses to their portfolio document. By such arrangement, information could be read and followed up faster.

One important information in Portfolio Insight is a menu called Top Items. This menu enables the users to identify

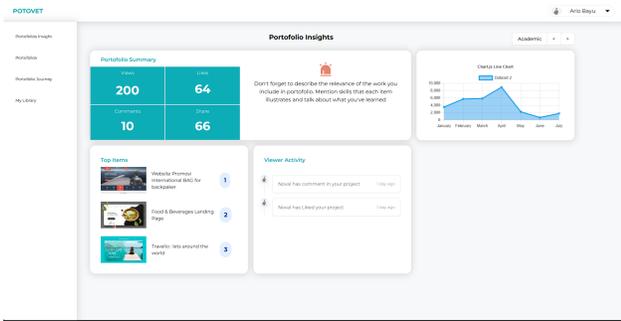


Figure 4. Interface of Portfolio Insight feature

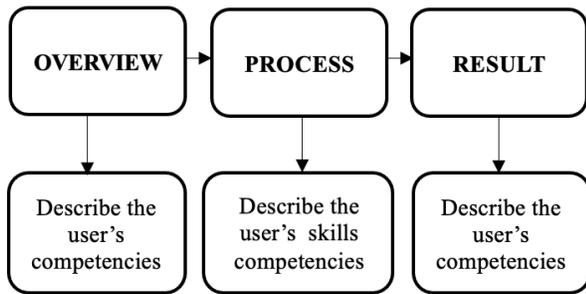


Figure 5. Interface of Portfolio Insight feature

which portfolio gets good feedback based on the rating given by other users or external users. Other important menu might be Viewer. The menu allows the users to know the activity of viewers with the portfolio.

Furthermore, Portfolio Insight facilitates the users in filtering data based on the category provided by the system. Users could do general monitoring or filtering only the required information. The interface of Portfolio Insight feature in electronic portfolio system is outlined in Figure 4.

C. Portfolios Feature

Portfolios is another feature in electronic portfolio system that usually precedes the creation of portfolio. Users often create portfolio by firstly filling in the menu of experience learning area. This menu is indeed focused on the description of skills and competencies. By using this feature, the users develop portfolio by filling in the content of skills and competencies. Stakeholders go directly to this feature in order to know the description of skills and competencies owned by users.

Creating portfolio in electronic portfolio system involves three stages, namely (1) overview, (2) process, and (3) result.

Overview is the early stage of portfolio development which contains the elaboration of ideas that underlie the project that should be stated in portfolio. Automatically, the system provides guidances to the users concerning how to display the description of skills and competencies. Next

INTRODUCTION	PROCESS	CONCLUSION
<input type="checkbox"/> Problem Statement	<input type="checkbox"/> Method	<input type="checkbox"/> Lesson that you learned
<input type="checkbox"/> Roles and Responsibilities	<input type="checkbox"/> Research Results	<input type="checkbox"/> Challenging and Impact
<input type="checkbox"/> Problem Interest and Challenging	<input type="checkbox"/> Wireframing	
<input type="checkbox"/> Final Solution	<input type="checkbox"/> Prototype	

Figure 6. Information in the development stages of electronic portfolio system [37][38][39]

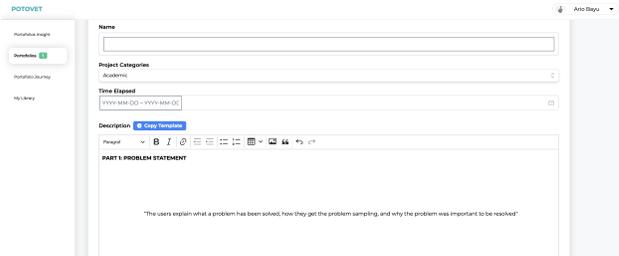


Figure 7. Interface of Portfolios feature

stage is Process, which explains how the users must develop project and presents the evidence of the project. In this stage, stakeholders could clearly see the project developed by users and make comparison with other projects (developed by other users). Final stage is Result, which is intended to show the results of reflection and conceptualization obtained by users concerning their project.

All three stages of portfolio development are systematic and chronological [39][40][41]. Each stage contains information that users need to complete. The information required in each stage is indicated in Figure 6.

The interface of Portfolios feature in electronic portfolio system is displayed in Figure 7.

In relation to the contents of Figure 8, the content of Overview contains the background of the project that users want to describe. Users provide the information about the project in Overview content with five data, respectively: (1) name, (2) project categories, (3) time, (4) project image, and (5) description.

The content of Process in Figure 9 contains the information about project development after the ideas that underlie the project are explored. This content presents learning outcomes by picture or video that follows information points. Learning outcomes could be complemented with supportive links, which are usually obtained through interface creation software or other prototypes.

Users fill in the information about project to Process content User with also five data, respectively: (1) method, (2) research result, (3) wireframing, (4) prototype, and (5) prototype URL.

Figure 10 exhibits Result content that contains informa-

TABLE VI. EXPLANATION OF OVERVIEW DATA

No	Data	Explanation
1	Name	Name of project
2	Project Categories	Origin of project based on activity type, which is differentiated into academic, professional, research and informal training
3	Time	Time needed for project completion
4	Project Image	General image for the project
5	*Description	*The description of competencies in relation with information points

\*. data are supported with the description of users competencies.

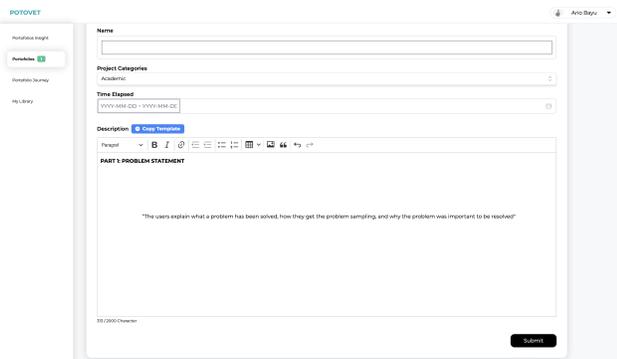


Figure 8. Interface of Overview Content

TABLE VII. EXPLANATION OF PROCESS DATA

No	Data	Explanation
1	*Method	Phase, stage, and steps of how the project is developed
2	*Research Result	Research result that answers the need for project development
3	**Wireframing	Document that explains project interface
4	**Prototype	Project sample
5	Prototype URL	Trial link for project sample (a functional alternative if the size of sample file is huge)

\*. data are supported with the description of users competencies.

\*\* . data are supported with the description of users skills.

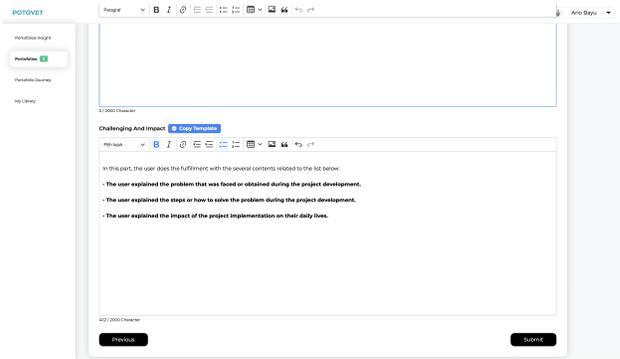


Figure 10. Interface of Result content

tion and insight regarding the challenge during project development and the impact of the project itself. Users could explain what challenge emerges during the development of project and what the solution taken to deal with this challenge. The impact in Result content is about what the impact of the project would be if the project is implemented.

Result content as indicated in Figure 10 is comprising information about the lessons that users could learn from the project and the challenge and impact of the lessons. The following table exhibits these information.

TABLE VIII. EXPLANATION OF RESULT DATA

No	Data	Explanation
1	*Lesson that you learned	Explanation about self-evaluation and experience that users get from project development
2	*Challenging and Impact	Challenge that users encounter during project development, the solution to deal with this challenge, and the impact of project implementation

\*. data are supported with the description of users competencies.

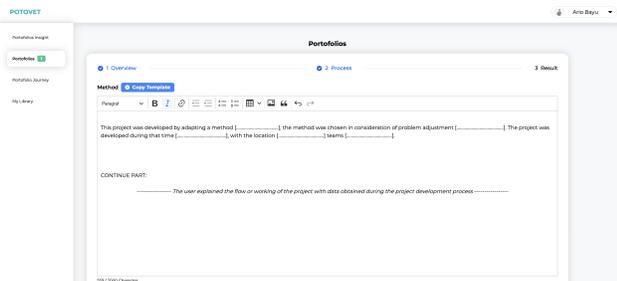


Figure 9. Interface of Process content

If portfolio development stages are already completed systematically, the display of digital portfolio would be like the one shown in Figure 11.

Figure 11 gives an illustration of project portfolio that has public access which could be shared by users to stakeholders. Portfolio gives users with two access options (public and private) which later differentiate the visibility of

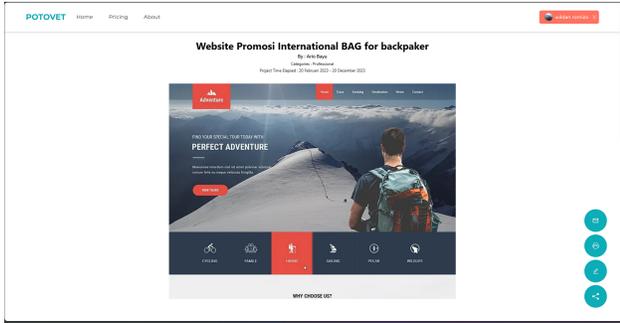


Figure 11. Interface of digital portfolio

portfolio to external users. Therefore, portfolio with private access would become users' archive and be managed by users in Portfolio Journey feature. Meanwhile, portfolio with public access would be public consumption and usually have more extensive reach due to its visibility to external users.

Users often do many activities on their portfolio such as editing, converting portfolio into document, and generating link for portfolio. External users could only response the display by sending messages, comments, and rating as the feedback for the portfolio that has been developed.

### 1) Navigation support System

Navigation support system in E-Portfolio facilitates the description of learning evidence. The description in this system usually comprises explanations regarding learning evidence at each stage of portfolio development.

Learning evidence and the description of learning evidence are integrated to each other in providing the description of skills and competencies. E-Portfolio overpowers other system through description because E-Portfolio system applies navigation concept to present the learning evidence and the description in sustainable way. Navigation device is supplied in the form of guidances regarding how to write description at each stage of portfolio development. For instance, the navigation support system provides textual guidance that is synchronous with the data. Texts are put below learning outcomes. Users then fill in the description based on this textual guidance. The existence of textual guidance could take form as the requirement of filling in the empty sentence as the main idea of paragraph, which is shown by dotted bracket [...], or the requirement of giving short explanation about the description that users want to write.

Specifically, navigation support system helps the users to understand what information that users need to write or explain as learning evidence. Therefore, the description of competencies owned by users could be presented accurately. In addition, navigation support system also reduces the confusion of users in writing the description and minimizes the incompatibility between information in learning outcomes

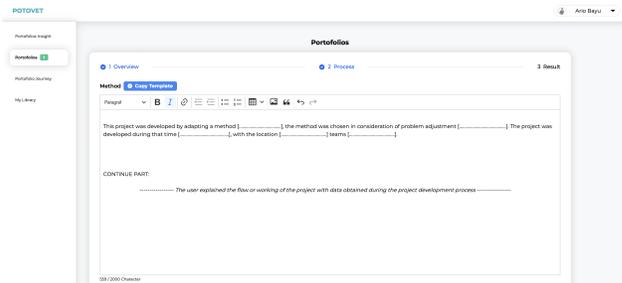


Figure 12. Navigation for filling in empty texts

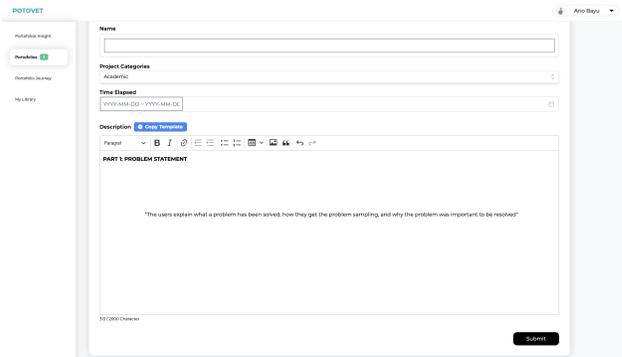


Figure 13. Navigation for short explanation of the description

and explanation in description. Figure 12 and Figure 13 show the example of navigation support for the description at portfolio development stages.

### D. Portfolio Journey Feature

Figure 14 illustrates the interface of Portfolio Journey feature that is functioned to display all portfolios made by users. Portfolios displayed in this feature have two status, respectively on progress or draft and finished. The status of on progress or draft is signified by red label which gives notification if the data in portfolio development stages (referring to Figure 6) are not completely filled. Anticipating this problem, users must fill in the data vacuity through portfolio development stages (referring to Figure 6) with the support of Edit icon. Finished status is denoted by green label, which sends notification if the data in portfolio development stages (referring to Figure 6) are complete already. Anyway, users could still change the data using Edit icon. After users change the data, the current data are automatically renewed based on the last alteration.

Moreover, in Portfolio Journey feature, users could check the portfolios made and displayed for public using Read More icon. The activity of searching portfolio in this feature is done by filtering the data based on year, month and text.

### E. My Library Feature

The feature of My Library is intended to save the learning outcomes in relation with the project developed by users. Relevant learning outcomes are then mapped

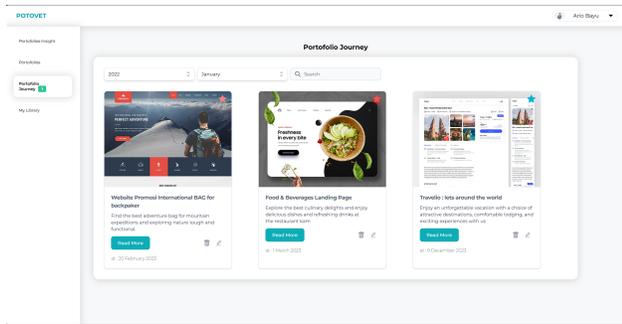


Figure 14. Interface of Portfolio Journey feature

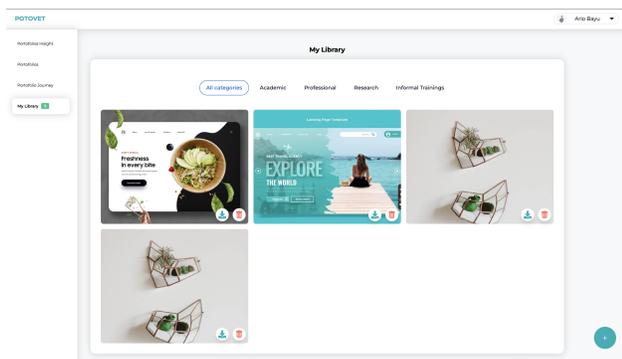


Figure 15. Interface of My Library feature

based on project category in Portfolios feature (academic, professional, research, and informal training).

Using this feature, users could add, delete and download the learning outcomes of each project category. Electronic portfolio system automatically records the learning outcomes in this feature when users develop their portfolio.

The interface of My Library feature is depicted in Figure 15.

## 7. CONCLUSION

E-Portfolio in this article is developed to support TVET graduates in pursuing for their career development and to fulfill the demand of the industry for ready-to-work graduates. As an education technology, E-Portfolio helps TVET graduates to get better understandings about skills and competences required by the industry and also facilitates the graduates to show off their skills and competences to the industry. The industry sector is enabled by E-Portfolio to receive more comprehensive, more detail and precise display about the skills and competences of TVET graduates.

The developed e-portfolio in this article is specified for career development. Four features supporting this E-Portfolio are: (1) Portfolio Insight, which is functioned as the recording of the data regarding activities on portfolio; (2) Portfolios, which functions to facilitate the filling in the content of skills and competences; (3) Portfolio Journey,

which is functioned as the overview of all developed portfolios; and (4) My Library, which is functioned to be the storage place for learning evidence of the users. Portfolio development in this article involves three stages, respectively overview, process and result. All these stages represent the fresh innovation in displaying and describing learning evidence of the graduates with additional navigation system, which is intended to make the skills and competences of the graduates to be described more precisely to the stakeholders or industry sector.

The design and benefits of E-Portfolio system could be used as the strategy that helps the graduates and also the stakeholders or the industry in managing and understanding the description of skills and competences. The impact of this strategy is improving the absorption of TVET graduates into the employment world.

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