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Evaluation of education and training programs in Solo Technopark Central Java in Indonesia

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Abstract

This study aims to evaluate the implementation of a training program for youth in Solo Technopark, Central Java, Indonesia, and get important feedback and recommendations to increase its effectiveness. The evaluation method used is based on four levels of the Kirkpatrick model to assess: (1) participants' reaction to the training program (to the contents, facilitators, and facilities); (2) training participants' learning (knowledge and basic skills); (3) change of participant behaviors; and (4) succeed of the training participants based on competence skills and rate of graduate employability and employer's satisfaction. Research respondents were 47 training participants from four optional courses at the reaction and learning level. There were 59 alumni, three training instructors, and one employer as the respondents at the behavior and results level. Data were collected using questionnaires, interviews, documentation, and an observation checklist. The data were analyzed using the quantitative descriptive analysis method. The study shows that: (1) at the reaction level, most training participants are satisfied with the training program, instructors, and facilities; (2) at the learning level, most participants have a good category in knowledge and basic skills; (3) at the behavior level, participants can implement the attitudes and major skills at a good level; (4) at the results level, alumni have high skills at workplaces; they have been employed in various industries, and the alumni's employability rate is less than 50%. To increase the low rate of employability in the labor market, Solo Technopark needs to improve alumni networking and collaboration with industries and employers.

***Keywords**: education and training, evaluation program, Kirkpatrick model, Solo technopark*

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Introduction

Indonesia has a golden opportunity to improve the welfare of its population through optimizing demographic bonus in the form of a larger percentage of the population of productive age (15 to 64 years). The Population and Family Planning Agency estimates that Indonesia will have a population of 305.65 million or even more in the year 2035. The composition of growth in the population of productive age in 2035 will reach 207.5 million people or as much as 67.9% of the population (Central Bureau of Statistics, 2013). Therefore, the government must educate and train them to become a skilled workforce. Conversely, if the government fails to educate them into a skilled workforce and there are not enough jobs available, then the opposite thing will happen. Unemployment rate will increase sharply so that it can result in an increase in various kinds of social crimes, such as theft, burglary and robbery.

The Central Bureau of Statistics stated that the educational background of workers in Indonesia in August 2019 was dominated by elementary aand junior high school graduates (45%), vocational and high school graduates as much as 38% and college and uviersities graduates as much as 17%. In February 2020 the number of workforce was 137.91 millions and the number of open unemployed was 6.88 millions (Central Bureau of Statistics, 2020). On the other hand, vocational schools (*sekolah menengah kejuruan* or SMK) which is expected to be able to produce skilled workers turned out to have the highest unemployment rate compared to other groups, 8.49% in the early 2020 (Suprayitna, 2020). With the large number of workers with low education, and the number of unemployed SMK graduates, in the future the government needs to: (1) prioritize the development of labor-intensive industries so that they can accommodate a large number of workers; and (2) provide alternative education and non-formal training in order to rapidly increase the competence of prospective workers.

The government through the Minister of Industry has identified several labor-intensive industries, such as textiles, footwear and garments that are capable of absorbing a workforce of 225 thousand people per year or 56% of the absorption of 400 thousand workers per year (Putra, 2019). Therefore, the government has encouraged investors to build labor-intensive industries, not capital-intensive industries, especially in provincies, so that they can reduce the rate of urbanization and simultaneously increase economic output and also labor absorption (Winardi, Priyarsono, Siregar, & Kustanto, 2019). For example, furniture industry that uses rattan and wood as a base material was developed in Palu, Central Sulawesi and in Kendal, Central Java which was also supported by the construction of the Furniture Industry Polytechnic to increase the competence of its human resources. The development of the furniture industry, based on data from Central Bureau of Statistics in 2017, there were 1,918 business units in the medium and large scale, capable of absorbing up to 200 thousand workers (Ministry of Industry of the Republic of Indonesia, 2019)

The government, through the Department of Manpower, has organized several forms of non-formal education and training in the regions, including training organized by the Work Training Agency. Currently, there are 305 work training agencies that are able to accommodate as many as 275 thousand participants, mostly primary school, junior high school, and senior high school/vocational high school graduates in various vocational fields, such as business and management, tourism, electronic engineering and others, which was served online via the official page, https:/kemnaker.go.id/training. Besides, the government also organizes non-formal education and training programs through the development of a science techno park (STP) in several regions. In 2019, 22 STPs spread across several provicincies.

Solo Techno Park in Solo, Central Java, developed since 2009, is an integrated technology area, as a development center for micro, small and medium enterprises (MSMEs), vocational training skills and innovations that combines elements of science and technology development, market, industry and business needs to strengthen the regional competitiveness. Solo Techno Park provides four training fields, namely manufacturing mechanics, manufacturing welding, manufacturing automation and manufacturing design.

The government needs to assess the extent to which the level of effectiveness of the training programs at Techno Park as one of the education and training institutions that is relied on in supporting the availability of skilled labor, how does the level suit the needs of the labor market, and the level of user absorption of graduates. Several studies that have been conducted have not specifically focused on the performance of the graduates. For example, Ramadhani (2015) evaluated the implementation process of the business and technology incubator program at Solo Techno Park. Mukhlish (2018) examined the model of collaboration between government, industry and universities developed in several institutions including Solo Teckno Park. In addition, Muhammad, et al. (2017) conducted a survey on the quality of a number of tecknopark embryos in Indonesia. Rahayu and Nurharjadmo

(2017) generally evaluated the implementation of the technopark solo development program. Pitaloka and Humaedi (2020) in their research explained that Science Technology Park can habituate the culture of science and technology in the community and reveal STP development phenomena in the regional context in Indonesia.

This research explains something different from the previous studies because it more specifically explains the evaluation results of training outcomes based on the opinions of participants, alumni and employers. The evaluation model of Kirkpatrick's four level is chosen because the model provides one technique for appraisal of the evidence for any reported training program and could be used to evaluate whether a training program is likely to meet the needs and requirements of both the organization implementing the training and the staff who will participate in it (Smidt, Balandin, Sigafoos, & Reed, 2009). Thus, the results become valuable inputs in improving the performance of non-formal education and training programs, especially at Solo Techno Park.

Method

This research was conducted at Solo Technopark in July to September 2019. The subjects of this study were the training participants, training alumni, and industrial employers of the alumni. The selection of respondents method was purposive sampling. The evaluation model used in this study was the Kirkpatrick model. This model consists of four levels: reaction, learning, behaviour, and results. Data were collected through interview, observation, questionnaires, and documentation. The respondents of the training program were 47 training participants for reaction and learning levels and 59 alumni for behaviour and results level. The scores collected from the questionnaires were graded in five categories based on the ideal mean and standard deviation, there were very low; low; intermediate; high; and very high, and the data were analyzed quantitively. Meanwhile, the data collected from observations and interviews were analyzed by using qualitative technique.

Indicators measured in the reaction aspect were training participants' motivation and satisfaction to the subject contents, the instructors and the facilities. Indicators measured in the learning aspects were understanding of the theories and the degree of practical skills. Indicators measured in the behaviour aspects are changes in the behaviour of training participants related to skills, attitude and changes in the behaviour of participants related to the skills after completing the program. Indicators measured in result aspect were the impact after attending the training program, the degree of absorption of graduates, and the impact of alumni in the work place.

Findings and Discussion

Evaluation of a training program using Kirkpatrick's four level model focuses on the development of training outcomes in training participants which includes: reaction, learning, behavor, and results. The evaluation of reaction is how the participant felt about the training or the learning experience. The evaluation of learning is the measurement of the increase in knowledge of the participants during the training activities. The evaluation of behavior is the extent of applied learning back on the work where the participant does their jobs. The evaluation of results is the effect on the business or environment by the participant. The reaction and learning criteria are considered internal, because they focus on what occurs within the training program. Moreover, the behavioral and results criteria focus on changes that occur outside (and typically after) the program, and are thus seen as external criteria (Praslova, 2010). Furthermore, Grohmann and Kauffeld (2013) stated that all of the four levels are important for training evaluation, because organizations can use the reaction level as an indicator of customer satisfaction, and the learning level is assumed to be a requirement for behavior change. Behavior level results can demonstrate how the training contents are actually applied to the job, so that it is organizationally usable, while the results level shows how the training contributes to organizational success.

Level 1: Reaction

The objective for the reaction measurement is to evaluate how each participant reacts to the training program. Questions were developed to figure out if the trainees enjoyed their experience and if they found the subject contents and facilities used in the program useful for their work. Aspects measured of the trainee reaction were: (1) motivation of attending the program; (2) response to the subject contents, to the facilitators/instructors and to the equipment and facilities provided in the training program.

In the Solo Technopark training program, according the trainees, motivation to participate the training was obtained that participants had a very high level of motivation that is equal to 48.90%. Participants who had a high motivation level were 44.70% and those who had moderate motivation were 6.40%. Distribution of respondents' answers to statements in the training participants' motivation questionnaire obtained the highest average percentage value on the statement that said "I feel happy in participating in training", as many as 20 respondents expressed very satisfied and 27 respondents said they were satisfied with the statement. Meanwhile, the respondent's answer with the lowest average percentage on the statement that says "ask if you have difficulty", as many as eight respondents said they were very satisfied, 38 respondents said they were satisfied, and one respondent said they were not satisfied. Based on these data, the participants' reactions were satisfied with the motivation to take part in the training, but it was necessary to be given the opportunity to ask questions if participants experienced difficulties.

The satisfaction of the participants to the subject matters in the training was in a very high level of satisfaction (63.8%). Participants who had a high level of satisfaction with the training material were 34.0% and those with moderate interest were 2.1%. Distribution of respondents' answers to statements in the questionnaire related to participant satisfaction with training material obtained the highest average percentage value is in the statement "The training subjcts provided are very useful for dealing with competition in the work place", 36 respondents stated very satisfied and 11 respondents said they were satisfied in the statement. Meanwhile, the respondent's answer with the lowest average percentage value on the statement that reads "material is well mastered", as many as seven respondents said they were very satisfied, 39 respondents said they were satisfied, and one respondent said they were not satisfied. Based on these data the participants' reactions were satisfied with the training material. However, seen from the lowest mean of the answers of respondents not all material is well mastered. This must be taken more seriously.

Participants' satisfaction with the training instructor results in the participant having a high level of satisfaction with the training instructor at 66.00%. Participants who had a high level of satisfaction with training instructors were 29.80% and those who had moderate satisfaction were 4.3%. Distribution of respondents' answers to statements in the questionnaire related to the participant satisfaction with training instructors obtained the highest average percentage value is in the statement "Instructor gives motivation to participants", 24 respondents stated very satisfied and as many as 22 respondents expressed satisfaction, and as many as one respondent states are in the statement. Meanwhile, the respondents' answers with the lowest average percentage value on the statement that said "question and answer time" show that eight respondents expressed very satisfied, 34 respondents said they were satisfied, and five respondents said they were not satisfied.

Degree of participants' satisfaction with education and training facilities gives the result that participants have a very high level of satisfaction with education and training facilities that is equal to 87.20%. Participants who had a high level of satisfaction with education and training facilities were 12.80%. Distribution of respondents' answers to statements in the questionnaire related to participant satisfaction with education and training facilities obtained the largest average value percentage was in the statement "all material available practical tools", 25 respondents said they were very satisfied and 22 respondents said they were satisfied with the statement. Meanwhile,

the respondent's answer with the lowest average percentage value on the statement "lunch time available", as many as eight respondents said they were very satisfied, 23 respondents said they were satisfied, 12 respondents said they were not satisfied, and four respondents said they were very dissatisfied. Based on these data, the participants' reactions were satisfied with the education and training facilities.

It is found that the satisfaction of participants in the training program have a direct impact on motivation and enthusiasm for learning. Chang and Chang (2012) also mentioned that the level of learning motivation directly affects learning satisfaction. Based on the results, it is concluded that the satisfaction of the participants in the motivation to take part in the training is included in both categories. It means that the training participants have motivation and enthusiasm for learning.

Level 2: Learning

The objective for the degree of the participant has been learning in the aspects of knowledge and basic skills. In this program, learning aspects are assessed based on the level of mastery of the subject contents and basic skills. Results of the measurement are shown in Figure 1. Understanding of theoretical training material provides the results of participants having a high level of understanding of theoretical material that is equal to 59.60%. Participants who had a very high level of understanding of theoretical material were 27.7% and participants who had moderate understanding of theoretical material were 12.80%.

Distribution of respondents' answers to the statements in the questionnaire related to participants' understanding of learning theory obtained the largest percentage of average values in the statement "I understand the material kinds of bench work equipment well", in which as many as 13 respondents stated very understanding, 33 the respondents said they understood, and one respondent did not understand the material. Meanwhile, the respondents' answers with the lowest average percentage value on the statement "I understand the basic theory of electrical welding", 12 respondents said they understood very well, 21 respondents said they understood, 14 respondents said they did not understand. Based on these data, participants understand the knowledge/learning of training theory. However, judging from the lowest answer average, there needs to be an increase in the basic material of electrical welding.

Mastery level of basic skills is shown in Figure 1. It is seen that most participants had a high level of understanding of the overall practice material that is equal to 68.10%. Participants who have a very high level of understanding of practice material are 19.10% and participants who have a moderate understanding of practice material are 12.80%. The detail degree of participants' understanding of the practical subject contents in the training program is explained as follows.

Practice of Bench Work

The participants' understanding of the bench work skills resulted in 25.5% being highly skilled in bench work skills, 58.6% skilled in bench work skills, and 14.9% having moderate skills in bench work skills. Distribution of respondents' answers to statements in a questionnaire related to participants' understanding of bench work skills obtained the largest percentage of the average value is in the statement "conducting a scroll using a tap" procedure, in which as many as 15 respondents expressed very understanding, and 32 respondents expressed understanding of the statement. Meanwhile, the respondent's answer with the lowest average percentage value on the statement "flow filing procedure" shows that six respondents said they understood very well, 25 respondents said they understood, and 12 respondents said that they did not understand.

Practice of the Grinding Tool

The participants' understanding of the tool grinding operation skills gave 17.0% results of very skilled participant in the tool grinding operation skills, 66.0% were skilled in the tool grinding operation skills, 10.6% had moderate skills on the tool grinding operation skills, and three respondents had the skills low in grinding tool operation skills.

Distribution of respondents' answers to statements in the questionnaire submitted by researchers related to their understanding of the grinding tool operation skills obtained the highest average percentage value was in the statement "carrying out the hand chiseling procedure", eight respondents said they really understood, 33 respondents stated they understood, and five respondents said they did not understand the material. Meanwhile, the respondent's answer with the lowest average percentage value on the statement "drill bit sharpening procedures" are ten respondents said they understood very well, 22 respondents said they understood, 13 respondents said they did not understand, and two people stated they did not understand the material.

Practice of Turning

The participants' understanding of turning lathes using level categorization yielded 29.8% highly skilled in turning lathes, 59.6% were skilled in turning lathes, and 10.6% had moderate skills. grinding tool operation skills.

Distribution of respondents' answers to statements in the questionnaire submitted by researchers related to the participants' understanding of turning operation skills (lathe) obtained the largest percentage of the average value is in the statement "I can do the average turning procedure well", in which as many as 20 respondents expressed very understanding, 26 respondents expressed their understanding, and one respondent did not understand the material. Meanwhile, the respondent's answer with the lowest average percentage value on the statement "lathe cartel procedure", is that as many as ten respondents said they understood very well, 23 respondents said they understood, ten respondents said they did not understand, and four respondents said they did not understand the material.

Practice of Technical Drawing

Participants' understanding of technical drawing skills using level categorization results in 12.8% highly skilled in technical drawing skills, 70.2% skilled in technical drawing skills, 8.5% have moderate skills in technical drawing skills, and 8.5% have low skills in technical drawing skills.

Distribution of respondents' answers to the statements in the questionnaire submitted by researchers related to participants' understanding of technical drawing skills obtained the largest percentage of the average value in the statement "applying equipment and standardization of images", where nine respondents expressed very understanding, 33 respondents expressed understanding, and five respondents said they did not understand the material. Besides, respondent's answer with the lowest average percentage value on the statement "procedure of drawing a size on a workpiece" shows six respondents expressed very understanding, 26 respondents stated they understood, 14 respondents stated did not understand, and one respondent stated really did not understand the material.

Practice of Basic Electrical Welding

Figure 1 shows that participants' understanding of basic electrical welding skills using level categorization results in 23.4% highly skilled in basic electrical welding skills, 29.8% skilled in basic electrical welding skills, 12.8% have moderate skills in basic electrical welding skills, and 34.0% have low skills in basic electrical welding skills. Frequency distribution of respondent's answers to statements in questionnaire related to participants' understanding of the subject matters and basic electrical welding skills obtained the largest percentage of the average value is in the statement "weld plate 8 mm with a horizontal position/1F" and "weld plate 8mm with a horizontal position-Horizontal/2F", where 14 respondents stated they understood very well, 17 respondents said they understood, and 16 respondents stated they had moderate skills in the statement. Besides, respondent's answer with the lowest average percentage value on the statement "weld plate 8 mm in a vertical position/3F", shows ten respondents said they understood very well, 14 respondents said they understood, 21 respondents said they did not understand, and two respondents stated really did not understand the material. Thus, the training participants are skilled in practical learning. However, seen from the lowest average answer, there are some matters that are not yet understood by the respondents.

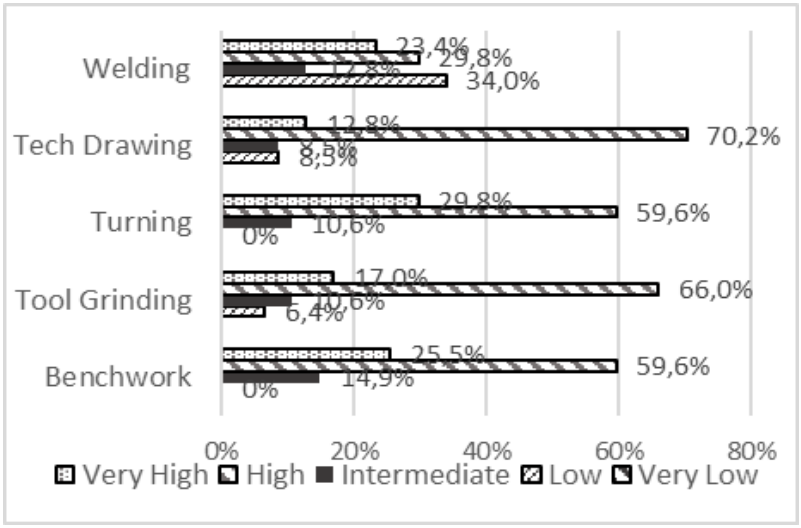

Figure 1. Percentage of Mastery of Basic Skills

Kirkpatrick (2006) explained there were three things taught in the education and training program: knowledge, skills, and behavioral attitudes. Gough (2018) agreed that TVET focuses on the process of gaining knowldge and skills for the world of work through cooperative relationships. Thus, it is concluded that the training participants understood the theoretical material and also the skills/practices. It means that participants are said to have learned if they have experienced an increase in knowledge, skills, and attitude changes in themselves. Without those three things mentioned in the training participants, then the training program can be said to be a failure.

Level 3: Behaviour

Change in behavior is an improvement of knowledge, attitude and practical skills of the alumni in their workplaces as a result of the training program. It is measured after the participant complete the program. There were 59 respondents doing internship program assessed in attitude and practical skills. The respondents are from four different courses: 25 respondents from manufacturing mechanics, seven respondents from welding, 15 respondents from automation mechanics, and 12 respondents from manufacturing design. The behavior changes in attitude skills shown by the participants after attending the training courses are as follow. Most participants have a very high level of skill is 27.1% and at moderate level in 72.9%.

According to the alumni responses, the distribution percentage of the alumni practical skills is shown in Figure 2. Participants' mastery of mechanical manufacturing skills were found that the majority of alumni has a high level of skill (64.0%). Almuni who have a very high skill level were 24.0%, participants who have moderate skill levels are 8.0%, and alumni who have a low skill level are 4.0%. In this course, it is found that there are several weakness of alumni's skills of basic subjects, such as in electric, pneumatic, and hydrolic

Behavior of alumni after the training of welding skills are as follow: alumni who have very high skill levels were 28.6%, a high level of skills is equal to 42.9%, alumni with moderate skills were 14.3% and alumni with low skills levels were 14.3%. The frequency distribution of the respondents' answers related to alumni understanding of skills in the direction of welding obtained the largest percentage of average values in the statement "understanding argon gas welding equipment (TIG Welding)" are three respondents stated very skilled, three respondents said skilled, and one respondent said not skilled in these skills. Meanwhile, the respondent's answer with the lowest average percentage value on the statement "skills to weld soft steel plates with argon gas welding (TIG Welding)" shows one respondent stated they were very skilled, three respondents stated skilled, two respondents said they were unskilled, and one respondent said not very skilled in these skills.

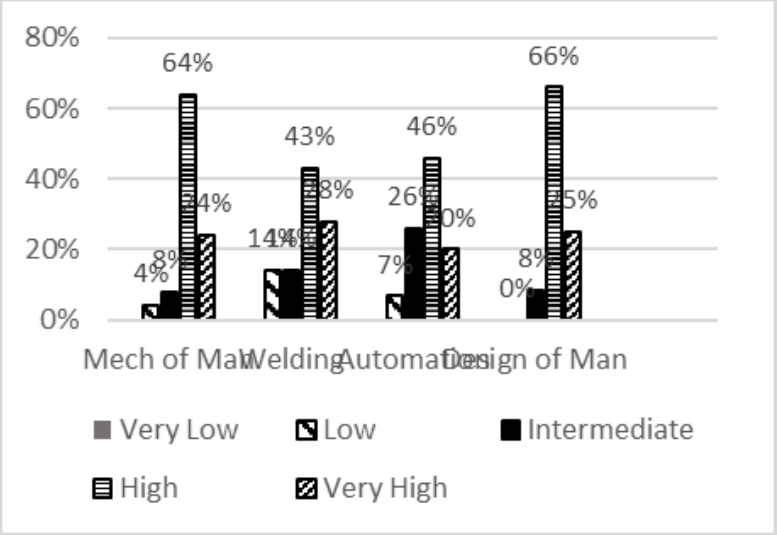

Figure 2. Degree of Participant's Behavior

In term of the behavior of alumni after the training related to the mastery of automation skills, it is obtained that the majority of participants have a high level of skills after the automation training, which was 46.7%. Alumni who had very high skill levels are 20.0%, participants who ave moderate skills levels are 26.7%, and participants who have low skill levels are 6.7%. Distribution of respondents' answers to the statements related to participants' skills in the department of automation obtained the largest percentage of the average value is in the statement "I master the use with one cylinder", as many as five respondents stated very skilled, nine respondents stated that they have moderte skill, and one respondent stated that he has medium skills on the statement. Further, the respondent's answer with the lowest average percentage value on the statement "hardware programming skills" shows that one respondent stated very skilled, six respondents stated skilled, and eight respondents stated unskilled in these skills.

In term of the behavior of alumni after the training of manufacturing design skills, it is obtained that the majority of participants have a high level of skill (66.7%). Alumni who have a very high skill level are 25.0%, and participants who had moderate skills levels after the training are 8.3%. It is found that the largest percentage of the average value is in the statement "drawing a picture of pieces with Auto-Cad", "drawing 2D & 3D images with Auto-Cad", and "mastering the basics of Autodesk-Inventor/Solid Work program", as many as four alumni said they were very skilled, and eight respondents said they were skilled. Meanwhile, the respondent's answer with the lowest average percentage value on the statement "drawing assembled kinematic simulations in CATs" shows that two respondents stated that they were very skilled, three respondents said they were skilled, and seven respondents stated that they were not skilled in these skills. Based on these data, participants are skilled in majors skills. However, there are skills that need to be improved, such as skill in drawing cavity and kinematic assembling in CATIA.

Level 4: Results

Assessment of results is a measurement of the primary goal of a program. Level four determines the overall success of the training model by measuring factors such as lowered spending, higher returns on investments, improved quality of products, less accidents in the workplace, the more efficient production time, and a higher quantity of sales. In this research, results of the program were measured in two aspects: impact of the alumni at the workplace, and employability rate of alumni. Based on the results of interviews with the employers and study of productivity documents, it can be concluded that according to the employers, the alumni of the Solo

Technopark training program have high quality knowledge and skills, are able to learn new skills and adapt to new environments quickly. This alumni's capability increases in the quality and quantity of products as well as product completion time according to the target so the cost production can be reduced.

Data of the employability rate is based on review to the alumni document collected in Solo Technopark office. There were 949 alumni listed in the document since 2016. There are 61 participants known resigned, 457 alumni are employed in 60 differents work places, 60 alumni are taking other courses, and two alumni are studying in universities. As much as 429 alumni have not been known where they are employed. The data show that the employablity rate of the alumni is less than 50% (457 out of 949) alumni in 2019.

Conclusion

Based on the results and discussion about the evaluation of training programs in Solo Technopark using four level Kirkpatric model, it can be concluded that according to respondents, the Solo Technopark training participants' level of satisfaction to the subjects contents, instructors, and training facilities is mostly moderate. Most participants of the training progam at the level of learning master the knowledge and basic skills well. At the level of behavior, most participants of the program have mastered high knowledge, attitude, and skills. At the results aspect, according to the employers, the alumni have high quality knowledge and skills, and are able to learn new skills and adapt to new environments quickly. Besides, based on the alumni document, it is known that the employability rate of the alumni is less than 50%. Therefore, Solo Technopark should have a better tracer study to improve the data quality of alumni by improving the networking of alumni and collaboration with many more industries and employers.

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