

Technology management: innovated water welding machine for entrepreneurship

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Abstract

The study aimed to determine the effectiveness and acceptability of an innovative water welding machine for entrepreneurship during the 2019-2020 academic year, as the basis for technology management. The innovative water welding machine for entrepreneurship for campus maintenance was evaluated on the acceptability of its effectiveness and sustainability, awareness, safety, and health. The quasi-experiment method, particularly survey research, was employed in this study. Questionnaires were given to 10 professors/instructors, 45 Second Year BIT Welding and Fabrication Technology students, 45 Third Year BIT Welding and Fabrication Technology students, and 5 Experts from Small Scale Industries, Pinamungahan, Cebu for evaluation. The study found that the technology management of innovative water welding machines for entrepreneurship on school campuses is highly acceptable for effectiveness, awareness, safety, and health. It is recommended to adopt this innovative technology Water Machine for maintenance and safety of end users.

Keywords: Acceptability; awareness; effectiveness; innovation; technology management; water welding machine.

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1. INTRODUCTION

Rainwater can even be utilized for potable drinking if the appropriate precautions are taken, making it a reasonably clean water supply. Crucially, it is a free resource that can be obtained in large quantities from pavement areas and roof catchments. It can be utilized for a variety of tasks, including drinking, cooling and heating, washing clothes, watering gardens, flushing toilets, and hygienic purposes (Marimuthu et al., 2024; Bazrafshan et al., 2024; Meskele et al., 2023). As a result, by relieving demand on the primary water supply, rainwater harvesting can contribute significantly to water sustainability (Laskar, 2022). Several studies have shown that installing a rainwater harvesting system in a building can save a significant quantity of water (Fatima et al., 2022; Hajani and Rahman, 2014; Feng et al., 2024). For instance, Muthukumaran et al. (2011) showed that utilizing rainwater in residential construction in regional Victoria, Australia can save approximately 40% of potable water. An office-based rainwater collecting system can save about 87% of water (amount of mains water saved) in a non-domestic structure, according to research by Ward et al. (2012).

Rainwater usually has a pH of 5.5 or below because of the presence of dissolved gases, such as carbon, nitrogen, and sulfur oxides, but it also lacks all dissolved particles. Rainwater in coastal regions may also include up to 15 mg/l of sea spray-derived sodium chloride. Therefore, rainwater has no alkalinity; instead, it has a low pH, is acidic (poor mineral content), and is aggressive toward things that contain calcium, such as concrete and other metals commonly used in home plumbing. The corrosivity is increased when chlorides are present. Because of its low solids content, rainwater also has an unpleasant flavor (Meera & Ahammed 2006).

Rock salt, also known as halite, is the name for salt in its natural state as a crystalline mineral. Salt is a mineral that largely consists of sodium chloride (NaCl), a chemical molecule that belongs to the wider class of salts. Seawater has a significant amount of salt, which is the primary mineral component. According to Vengosh et al., (1999), the open ocean contains roughly 35 grams (1.2 oz) of sediments per liter of seawater. Welding is a construction or creative technique that joins materials, usually metals or thermoplastics, by melting, cooling, and then fusing the constituent parts. Welding is distinct from brazing and soldering, two lower-temperature metal-joining techniques that don't melt the base metal (Kah et al., 2014). Welding is the joining and fusing of two materials, such as plastic, polymer, brass, aluminum, steel, or stainless steel. A welder is an instrument used in welding. A filler is a molten metal or plastic substance that is used to join the parts under work.

Solar energy captures radiant heat and light from the Sun through various technologies, including heating, photovoltaics, thermal energy, architecture, and synthetic photosynthesis (Jain, 2018). A battery is a device that uses an electrochemical reaction to transform the chemical energy present in its active components directly into electrical energy. Photovoltaic (PV) lighting systems require rechargeable batteries.

Miller Electric Mfg. Co. conducted a survey in America with fabricators, manufacturers, contractors, and other stakeholders regarding welding-related concerns; These included the need to lower welding expenses, boost productivity, solve the shortage of welders, find ways to justify new equipment purchases, and streamline the welding procedure (Mendez, 2014). These problems are covered in this article along with examples of businesses that have effectively dealt with similar problems in the past. The need to lower welding costs, increase welding productivity, find qualified welders, purchase new equipment with limited funds, and streamline our welding process are the most pressing welding-related issues. How these Key Business Issues (KBIs) materialize depends on a company's organizational structure or business emphasis (MacDuffie & Helper, 1997). For instance, business A might stress higher production to satisfy the needs of a big project. Given the same circumstances, Company B might feel that increasing operator efficiency is necessary. Knowing that its welders are already producing at their highest capacity,

Company C may wish to expand, but it is having problems locating skilled welders. Although he is aware that purchasing new equipment will help him meet demand, Company D's welding supervisor is finding it difficult to persuade the finance committee of this. The operations manager at Company E is aware that by locating equipment that lowers operator errors, he might boost output. The main company problems are frequently connected, and solving one usually makes other areas better. Increasing productivity should eventually result in decreased welding costs, serve as a foundation for equipment investment, and possibly even reduce the need for labour.

At this point, the researcher initially surveyed by asking the community in Pinamungajan, Cebu if they wanted to make a welding fabrication business but it needed a welding machine and capital to do the job. The researcher also conducted a survey of the BIT students and CTU-PEC extension students about the importance of welding machines used for the welding business in the locality. These are now the issues that the researcher needs to solve and acquire cheap welding machines to serve the community as part of the University's advocacy.

After the survey, the researcher found out that the community has acquired a cheap and durable machine, since they cannot afford a cheap machine, they plan to make an improvised welding machine. From this, the researcher partially answered the problem issues in the community. The researchers innovate the conventional transformer welding into a water welding machine. This water welding machine can weld the same with the conventional characteristics. It varies only in the mechanism and the power source. This water machine has to use the following materials namely: Rain Water, Salt, welding positioner, and welding accessories. The researcher also uses Polychloride (PVC) Pipes, Fittings, and other metals from junkyards to utilize waste materials. The Innovated Water Welding Machine can weld 6G welding position by using the welding positioner with retractable arms and welding holders and compartments.

1.1. Related studies

A device may induce coalescence (typically by melting small portions of joint materials, mainly metals or thermoplastics) by applying an electric current to them (Prabhu, 2010). Welding equipment is called a welder. The pieces that are being worked on are held together using molten metal or plastic called filler. Welding materials, gas flames, electric arcs, lasers, electron beams, friction, and ultrasonic can all be done with a variety of energy sources.

A fuzzy inference control circuit introduces the feedback signal, generates the welding current and welding voltage waveforms needed to produce the ideal arc state based on the fuzzy inference, and delivers the resulting waveforms to the output control circuit as the output control signal. These components make up an arc welding machine. An output detection circuit measures the state of the arc output and produces a feedback signal indicative of the output arc state.

1.2. Purpose of study

To inform technology management, this study intends to ascertain the viability and efficacy of a novel water welding machine for entrepreneurship at Cebu Technological University's Pinamungajan Extension Campus, Pinamungajan, Cebu, during the 2019–2020 academic year.

It specifically looked for responses to the following queries:

1. What are the prior arts related to welding machines?
2. What are the characteristics for the development of the Innovated Water Welding Machine to:
 - 2.1. features and functions;
 - 2.2. fabrication;
 - 2.3. ergonomics;

- 2.4. cost; and
- 2.5. safety?

3. As rated by the respondent groups, what is the level of effectiveness of an innovative water Welding Machine for entrepreneurship as to the aforementioned requirements?
4. What is the performance the effectiveness of an innovative water Welding Machine and a conventional welding machine?
5. As evaluated by the respondent groups to what extent is the effectiveness of an innovative water welding machine based on technology transformation culture?
6. Based on findings what technology model can be developed?

1.2.1. Null hypothesis

There is no significant difference between conventional welding machines and the Innovated Water Welding Machine for Entrepreneurship towards technology management.

2. METHOD AND MATERIALS

2.1. Data collection tool

In order to obtain the necessary information for the efficient planning, designing, manufacturing, and installation of an innovative water welding machine, this study employed the quasi-method of research to collect important data. The primary tool is the questionnaire, and the form of data acquisition is the normative survey. This study used quasi-experimental approaches, specifically survey research. Two sets of surveys were available: one was intended for students, and the other was for experts, faculty, and the community. There is a close relationship between the content of the student and instructor questionnaires. Only the tool's efficacy in terms of its functionality, construction, design, and aesthetics was requested to be answered. The final section of the questionnaire, which is used for formal and informal interviews as well as other documentation analyses to elucidate unclear information, was the only area where there was a difference.

2.2. Participants

Ten professors, ninety students, and thirty entrepreneurs were given questionnaires to complete for assessment. Sixty-seven specialists from small-scale industries, faculty from CTU, and members of the community answered the questionnaires that were used to gather the data.

2.3. Data analysis

The t-test, weighted mean, and total weighted points were applied to the collected data. Technology Production Management provided the tools for this investigation (TPM).

3. RESULTS

3.1. The characteristics for the development of the innovative water welding machine regarding features and functions; fabrication and installation; ergonomics; cost; and safety

An innovative water Welding Machine has characterized its features, Functions, Fabrication, Cost, and Safety. It illustrated and discussed the attributes from the start to the end product.

Table 1
Features

Water Welding Machine Features	Gauges of Effectiveness					
	VHE	VE	E	NE	x	%
<i>High Temperature Casing</i>	1	64	1	0	66	20.49

<i>Salt Water serves as a Transformer</i>	1	62	1	0	64	19.87
<i>Energy Free (Solar Energy Provisions)</i>	1	63	1	0	65	20.18
<i>Attached Welding Positioner</i>	1	62	1	0	64	19.87
<i>Easy to Mobilized</i>	1	61	1	0	63	19.56
Total:	5	312	5	0	322	99.97
Interpretation:	VERY ACCEPTABLE					

N=70

Note:

4	VHA	Very Highly Acceptable	X	SUM
3	VA	Very Acceptable	%	Percentage
2	A	Acceptable	VD	Verbal Description
1	NA	Not Acceptable		

Table 1 presents the features of an Innovative water welding machine. There were 5 welding features such as: High-Temperature Casing; Salt Water service as a Transformer; Energy Free (Solar Energy Provisions); Attached Welding Positioners; and Easy to Mobilized. Based on the data presented above, 64 respondents rated “Very Acceptable” for “High-Temperature Casing”; 63 respondents rated “Very Acceptable” for “Salt Water serve as Transformer”; 62 respondents rated “Very Acceptable” for “Energy Free (Solar Energy Provisions)”; 62 respondents rated “Very Acceptable” for “Attached Welding Positioner” and 61 respondents rated “Very Acceptable” for “Easy to Mobilized”.

Therefore, there were 66 or 20.49% respondents for “High-Temperature Casing “64 or 19.87% respondents for “Salt Water serves as Transformer “, 65 or 20.18% respondents for “Energy Free (Solar Energy Provisions)”; 64 or 19.87% respondents for “Attached Welding Positioner “and 63 or 19.56% respondents for “Easy to Mobilized” responded.

The Water Welding Machine is a welding process in which the source of heat comes from the electrical current. This heat is the result of the conversion of electric power that is converted into heat when the electrode is attached to the base metal. The meeting between the electrode and the base metal is caused by ion exchange.

Table 2
Functions

Water Welding Machine Functions	Gauges of Functionality					
	VHF	VF	F	NF	x	%
<i>Water Welding Machine</i>	2	55	1	0	58	12.55
<i>Electrode Cable</i>	2	55	1	0	58	12.55
<i>Massa Cable</i>	2	55	1	0	58	12.55
<i>Welding Power Source</i>	2	55	1	0	58	12.55
<i>Current Control</i>	2	55	1	0	58	12.55
<i>Electrode Holder</i>	2	55	1	0	58	12.55
<i>Earth Cramp</i>	2	55	1	0	58	12.55
<i>Switch</i>	1	56	0	0	57	12.33
<i>Electrode</i>	1	56	0	0	57	12.33
Total:	16	47	7	0	462	99.96
Interpretation:	VERY FUNCTIONAL					

N=70

Note:

4	VHF	Very Highly Functional	X	SUM
3	VF	Very Functional	%	Percentage
2	F	Functional	VD	Verbal Description
1	NF	Not Functional		

Table 2 presents the functionality of An Innovated Water Welding Machine. There were 9 accessories that the water welding machines work Water Welding Machine, Electrode Cable, mass cable, Welding Power Source, Current Control, Electrode Holder, Earth Cramp, Switch, and Electrode.

Based on the data presented above, the respondents rated by welding parts. There were 55 respondents rated as "VERY FUNCTIONAL" Water Welding Machine; Electrode Cable; Massa Cable; Welding Power Source; Current Control; Electrode Holder; and Earth Cramp, and 56 respondents rated as "VERY FUNCTIONAL" Switch and Electrode. The implication of the table presented; respondents answered in terms of "VERY FUNCTIONAL" after performing the actual using the innovative water welding machine.

Fabrication and welding allow for metal structures to be made into a range of shapes and sizes. It can be applied to a variety of industries such as engineering, construction, marine, and more.

Table 3
Fabrication

Water Welding Machine Fabrication	Gauges of Acceptability					
	VHA	VA	A	NA	x	%
<i>No cracks or holes were found in the bead.</i>	1	52	7	0	60	26.08
<i>The bead has uniform waves, width, and height.</i>	1	53	1	0	55	23.91
<i>The finished product satisfies the design dimensions and has almost no distortion.</i>	1	54	5	0	60	26.08
<i>The welding meets the required strength.</i>	1	52	2	0	55	23.91
Total:	4	211	15	0	230	99.98
Interpretation:	VERY ACCEPTABLE					

N=70

Note:

4	VHA	Very Highly Acceptable	X	SUM
3	VA	Very Acceptable	%	Percentage
2	A	Acceptable	VD	Verbal Description
1	NA	Not Acceptable		

Table 3 presents the acceptability of the fabrication of the Innovated Water Welding Machine. There were 4 attributes that the innovation passed the quality after the testing of the structures of the frameworks. Based on the table presented after the respondents responded were 1 for Very Highly Acceptable; 52 for Very Acceptable, and 7 for Acceptable in terms of "No cracks or holes found in the bead"; 1 for Very Highly Acceptable; 53 for Very Acceptable; 1 for Acceptable in terms of "The bead has uniform waves, width, and height" 1 for Very Highly Acceptable 54 for Very Acceptable 5 for Acceptable in terms of "The finished product satisfies the design dimensions and has almost no distortion"; and 1 for Very Highly Acceptable; 52 for Very Acceptable; 2 for Acceptable in terms of "The welding meets the required strength".

Therefore, there were 60 or 26.08% for "No cracks or holes found in the bead", 55 or 23.91% for "The bead has uniform waves, width and height", 60 or 26.08% for "The finished product satisfies the design dimensions and has almost no distortion" and 55 or 23.91% for "The welding meets the required strength".

Out of 230 respondents who answered about the acceptability of the Innovated Water Welding Machine Fabrication, 211 answered "VERY ACCEPTABLE" with a rated percentage of 99.98%.

Good welding begins with a properly planned and executed installation. Listed here in Table 4, are 10 guidelines for the proper and safe installation of a welding machine. Remember, however, to always consult the manufacturer’s installation guide for specific information about the machine you are installing.

Table 4
Installation

Water Welding Machine Installation	Gauges of Acceptability					
	VHA	VA	A	NA	x	%
<i>Install welding equipment in uncluttered areas where there is room for handling the materials to be welded without bumping into columns, walls, or adjacent machinery.</i>	1	44	2	0	47	9.59
<i>Keep the welding area reasonably clean, with no litter on the floor, and practice good housekeeping.</i>	1	54	2	0	57	11.63
<i>Large quantities of fresh air should be available for ventilation and cooling.</i>	1	54	2	0	57	11.63
<i>Welding areas should be separated from plant areas that generate excessive moisture, dust, or corrosive or flammable fumes.</i>	1	44	2	0	47	9.59
<i>The temperature in the welding area should not be high because the heat generated during welding can increase temperatures excessively</i>	1	44	2	0	47	9.59
<i>An adequate supply of the right type of electrical power should be available. If you have any questions, contact your electric power company.</i>	1	44	2	0	47	9.59
<i>Follow the manufacturer’s installation instructions concerning fuse size input- and ground-wire size.</i>	1	45	2	0	47	9.59
<i>Provide adequate, even support for the welding equipment. Equipment that is installed outdoors should be protected from the elements.</i>	1	44	2	0	47	9.59
<i>The frame of the welder should be solidly grounded electrically, and all electrical connections should be checked for tightness.</i>	1	45	2	0	47	9.59
<i>Be sure the welding cables have sufficient capacity to handle the current and are well-insulated.</i>	1	44	2	0	47	9.59
Total:	10	462	20	0	490	100
Interpretation:	VERY ACCEPTABLE					

N=70

Note:

4	VHA	Very Highly Acceptable	X	SUM
3	VA	Very Acceptable	%	Percentage
2	A	Acceptable	VD	Verbal Description

1 NA Not Acceptable

Table 4 presents the installation processes of an Innovated Water Welding Machine. There were 10 attributes such as 4 or 9.59% for “Install welding equipment in uncluttered areas where there is room for handling the materials to be welded without bumping into columns, walls, or adjacent machinery”; 57 or 11.63% for “Keep the welding area reasonably clean, with no litter on the floor, and practice good housekeeping”; 57 or 11.63% for “Large quantities of fresh air should be available for ventilation and cooling”; 47 or 9.59% for “Welding areas should be separated from plant areas that generate excessive moisture, dust, or corrosive or flammable fumes”; 47 or 9.59% for “The temperature in the welding area should not be high because the heat generated during welding can increase temperatures excessively”; 47 or 9.59% for “An adequate supply of the right type of electrical power should be available. If you have any questions, contact your electric power company”; 47 or 9.59% for “the manufacturer’s installation instructions concerning fuse size and input- and ground-wire size”; 47 or 9.59% for “Providing adequate, even support for the welding equipment. Equipment that is installed outdoors should be protected from the elements”; 47 or 9.59% for “the frame of the welder should be solidly grounded electrically, and all electrical connections should be checked for tightness”; 47 or 9.59% for “Be sure the welding cables have sufficient capacity to handle the current and are well-insulated.”

From the table presented above concerning the installation of an Innovated Water Welding Machine, the respondents rated it “VERY ACCEPTABLE” .

Welding positioners optimize the welder’s time and floor space, allowing production to flow more efficiently and reduce costs by decreasing floor space and increasing welding speed and quality. Not only do welding positioners financially help the company, but they also have an enormous effect on the welders themselves.

Table 5
Ergonomics

Water Welding Machine Ergonomics	Gauges of Acceptability					
	VHA	VA	A	NA	x	%
Improved weld quality	2	60	3	0	65	17.56
Simplified tool access	2	58	0	0	60	16.21
Consistent repeatable assembly procedures	2	58	0	0	60	16.21
Higher productivity and reduced consumables	2	57	1	0	60	16.21
Proper ergonomics with reduced operator fatigue and injury risk	2	59	4	0	65	17.56
Higher throughput and profits	2	58	0	0	60	16.21
Total:	12	350	8	0	370	99.96
Interpretation:	VERY ACCEPTABLE					

N=70

Legend:

- 4 VHA Very Highly Acceptable X SUM
- 3 VA Very Acceptable % Percentage
- 2 A Acceptable VD Verbal Description
- 1 NA Not Acceptable

Table 5 presents the ergonomics of an Innovated Water Welding Machine. It shows that there were 6 attributes such as: 1. Improved weld quality; 2. Simplified tool access; 3. Consistent repeatable assembly procedures; 4. Higher productivity and reduced consumables; 5. Proper ergonomics with reduced operator fatigue and injury risk; 6. Higher throughput and profits. Based on the data presented above there were 2 “VHA”; 60 “VA”; and 3 “A” respondents answered in terms of” Improved weld quality; 2 “VHA”; and 58 “VA”; respondents answered in” Simplified tool access”; 2 “VHA”; and 58 “VA”; respondents answered in

terms of” Consistent repeatable assembly procedures”; 2 “VHA”; 57 “VA”; and 1 “A” respondents answered in terms of” Higher productivity and reduced consumables”; 2 “VHA”; 59 “VA”; and 4 “A” respondents answered in terms of” Proper ergonomics with reduced operator fatigue and injury risk”; 2 “VHA”; and 58 “VA” respondents answered in terms of “Higher throughput and profits”.

The effect was maximum of the respondents “VERY ACCEPTABLE” in terms of Ergonomics after the demonstration on how the Innovated Water Welding Machine was used. The selected respondents recommend producing the machine for the small-scale business.

Table 6

Cost

Code	Item Description	Units	Quantity	Price	Amount	Total Cost
A.	Metal Frame Works:					
A1.	High Tempered Box	1	unit	500.00	500.00	
A2.	8"x10mm Metal Bolts	3	Pcs.	15.00	45.00	
A3.	10mm Mechanical Nuts	9	Pcs.	10.00	90.00	
A4.	20mm Metal Plain Washers	9	Pcs.	5.00	45.00	
A5.	Roller Casters	4	Pcs.	150	600.00	
A6.	1"x1/8" Angle Bars	2	Length	450	900.00	
A7.	1" dia G.I. Pipes	1	Length	450	450.00	
A8.	Welding Rod	2	kilos	220	440.00	
A9.	1" Aluminum Wall Angle	1	Length	160	160.00	
A10.	1" Metal Screw	20	Pcs.	2.00	40.00	
A11.	1"x4"x 12" S4s	1	Length	240	240.00	
A12.	Sealant	1	Pc.	250	250.00	
	<i>Sub-Total:</i>					3,760.00
B.	Labor and Transportation Cost:					
B1.	Labor	45%				1,504.00
B2.	Transportation	5%				188.00
C.	Grand Total:					Php 5,452.00

N=70

Table 6 presents the cost of the Innovated Water Powered Welding Machine. Based on the table presented, there were 3 item descriptions: the Metal Frameworks, Solar Panel Installation, and the Labor and Transportation Cost. The cost for materials was Php 3,760.00 only, and the labor cost was Php 1,504.00 only and for the transportation was also 188.00 only.

The implication of Table 6 was “Not Expensive” to acquire the unit. But concerning sustainability, the innovative water welding machine will last long term and the ROI will return. This will now be used for entrepreneurs in the community.

Table 7

Safety

Water Welding Machine Safety	Gauges of Acceptability					
	VHA	VA	A	NA	x	%
Welding area setup	2	55	3	0	60	28.57
Welding Area Ventilation	1	52	2	0	55	21.42
Proper personal protective equipment	2	52	1	0	55	21.42
Safe, quality welds	2	55	3	0	60	28.57
Total:	7	214	9	0	230	99.98
Interpretation:	VERY ACCEPTABLE					

N=70

Legend:

4	VHA	Very Highly Acceptable	X	SUM
3	VA	Very Acceptable	%	Percentage
2	A	Acceptable	VD	Verbal Description
1	NA	Not Acceptable		

Table 7 presents the safety of the Innovated Water Welding Machine. There were 4 safety precautions such as: Welding area setup; Welding Area Ventilation; Proper personal protective equipment; and Safe, quality welds. Based on the table presented above there were 2 “VHA”; 55 “VA” 3 “A” respondents answered “Welding area setup”; 1 “VHA”; 52 “VA” 2 “A” respondents answered “Welding Area Ventilation” 2 “VHA”; 52 “VA” 1 “A” respondents answered for “Proper personal protective equipment” 2 “VHA”; 55 “VA” 3 “A” respondents answered for “Safe, quality welds”.

The respondents answered “VERY ACCEPTABLE” with a rated score of 230 or 99.98% in terms of the safety of the machine and the users.

3.2. Level of the effectiveness of an innovative water welding machine for entrepreneurship as to the aforementioned requirement

The summary of the effectiveness of an innovative water welding machine for interpretations as to Welding Machine Features, Functions, Fabrications, Installation, Ergonomics, and Safety. The results collected from selected data were tallied and interpreted.

Table 8

Level of effectiveness

Welding Machine Characteristics	Gauges of Effectiveness					
	VHE	VE	E	NE	x	%
Features	5	312	5	0	322	99.97
Functions	16	47	7	0	462	99.96
Fabrication	4	211	15	0	230	99.98
Installation	10	462	20	0	490	100
Ergonomics	12	350	8	0	370	99.96
Safety	7	214	9	0	230	99.98
Total:	54	1596	64	0	2104	99.97
Interpretation:	VERY EFFECTIVE					

N=70

Note:

4	VHE	Very Highly Effective	X	SUM
3	VE	Very Effective	%	Percentage
2	E	Effective	VD	Verbal Description
1	NE	Not Effective		

Table 8 presents the summary of the level of effectiveness of an innovative Solar Powered Water Welding Machine. It is shown that the results from Features, Functions, Fabrication, Installation, Ergonomics, and Safety. Based on the data, there were respondents answered 5 for Very Highly Effective, 312 for Very Effective, 5 for Effective and 0 for Not Effective in terms of Features of the water welding machine; 16 for Very Highly Effective, 47 for Very Effective, 7 for Effective and 0 for Not Effective in terms of Functions of the water welding machine; 4 for Very Highly Effective, 211 for Very Effective, 15 for Effective and 0 for Not Effective in terms of Fabrication of the water welding machine; 10 for Very Highly Effective, 462 for Very Effective, 20 for Effective and 0 for Not Effective in terms of Installation of the water welding machine; 12 for Very Highly Effective, 350 for Very Effective, 8 for Effective and 0 for Not Effective in terms of Ergonomics of the water welding machine; 7 for Very Highly Effective, 214 for Very Effective, 9 for Effective and 0 for Not Effective in terms of Safety of the water welding machine.

The effect of the innovative Solar Powered Water Welding Machine in terms of EFFECTIVENESS was “VERY EFFECTIVE” with the results of 2,104 or 99.97% rated by the respondents.

3.3. Performance of the effectiveness of innovative water welding machines and conventional welding machine

The performance of the Effectiveness of Innovated Water Welding Machine and the Conventional was based on the result after using the three types of welding machines.

Table 9
Performance of an innovative water welding machine

Welding Machine Characteristics	Gauges of Effectiveness					
	VHE	VE	E	NE	x	%
<i>Transformer Type of Welding Machine</i>	20	37	3	0	60	33.33
<i>Inverter Type Welding Machine</i>	25	32	3	0	60	33.33
<i>Innovated Water Welding Machine</i>	3	57	0	0	60	33.33
Total:	48	126	6	0	180	99.99
Interpretation:	VERY EFFECTIVE					

N=70

Legend:

- 4 VHE Very Highly Effective X SUM
- 3 VE Very Effective % Percentage
- 2 E Effective VD Verbal Description
- 1 NE Not Effective

Table 9 presents the performance of an innovative water welding machine and a conventional welding machine. There were three welding machineries used such as: Transformer Type of Welding Machine; Inverter Type Welding Machine and the Innovated Water Welding Machine. Based on the data rated by the respondents, there were 20 for Very Highly Effective; 37 for Very Effective; and 3 for Effective in terms of using the “Transformer Type of Welding Machine”; 25 for Very Highly Effective; 32 for Very Effective; and 3 for Effective in terms of using the “Inverter Type Welding Machine”; 3 for Very Highly Effective; 57 for Very Effective in terms of using “Innovated Water Welding Machine”.

The respondents were rated 57 or 95% for the utilization of the “Innovated Water Welding Machine”.

4. DISCUSSION

When the usage of iron increased and was necessary for both the production of iron and the completion of finished goods, welding initially emerged as a method of fundamental economic importance (Lancaster, 1999). The process of joining two or more pieces of material (plastics or metals) together by applying pressure and/or heat is called welding.

Welding is a multibillion-dollar fabrication technology utilized globally in the automotive, aircraft, aerospace, energy, shipbuilding, and electronic industries, as well as in the construction of buildings and bridges. Many people consider welding to be a primitive science, possibly because it is a building practice. Over the past few decades, welding has developed into an interdisciplinary activity that calls for the integration of cutting-edge instruments from multiple basic and applied sciences with knowledge from other disciplines. New contributions are currently being made by scientists from a wide range of disciplines, including mechanical, chemical, and electrical engineering; arc and plasma physics; thermodynamics; high-temperature chemistry; materials science; transport phenomena; mathematical modelling; computer science; robotics; and economics (David and DebRoy, 1992).

The degree of Innovated Water Welding Machine has advantages and limitations such as: for advantages is easy to make, PVC pipe as a welding chamber, Retractable Welding Positioner, a Very small amount to acquire materials, works on the available voltage, Works on normal penetration of welding joint, works on easy position with the welding positioner. PPE must be worn appropriately because it may result in short circuits and high current, which poses a greater risk to users (Koc, Ekmekcioğlu & Gurgun, 2021).

The project's main aims were to fabricate, install, and evaluate the effectiveness of the Innovated Water Welding Machine in the Municipality of Pinamungajan, Pinamungajan, Cebu, during Fiscal Year 2019-2020. Primarily, it focuses on the technical aspect which is fabricating the machine and installing it in a suitable location. The fabrication process involved designing and constructing a machine that utilizes water as a welding medium. The installation aimed to identify an appropriate site, ensure safety measures, and establish a reliable power source.

Furthermore, this study emphasizes the community-oriented objectives which are determining the machine's effectiveness, enhancing the local community, and promoting entrepreneurship. Evaluating the machine's effectiveness involved conducting tests to assess its welding capabilities, efficiency, and reliability. The project aimed to enhance the community by providing increased access to welding services, promoting skill development, and stimulating economic growth. Additionally, the project aimed to foster entrepreneurship by encouraging individuals to start their welding businesses using the Innovated Water Welding Machine, providing training and support for aspiring entrepreneurs.

Overall, the project sought to achieve technological innovation, community development, and entrepreneurship promotion through the fabrication, installation, and evaluation of the Innovated Water Welding Machine in Pinamungajan, Cebu during the specified fiscal year.

5. CONCLUSION

In the study or demonstration involving the innovative water welding machine, the respondent groups consistently highlighted the effectiveness and acceptability of the technology. The machine's ability to facilitate easy selection between low and high-power options for welding was a key factor contributing to its perceived ease of use. This feature allowed users to adjust the power settings based on the specific welding requirements, making it adaptable to different materials and welding scenarios. By providing this level of control and flexibility, the water welding machine empowered users to achieve optimal welding results with convenience and efficiency.

Furthermore, the respondents were impressed by the affordability and ease of assembly of the innovative water welding machine. Cost-effective technology makes it accessible to diverse users. The machine's affordability, coupled with its ease of assembly, meant that individuals could acquire and set up the equipment without significant financial or technical barriers. This combination of low cost and easy assembly further enhanced the accessibility and practicality of the water welding machine, positioning it as a promising solution in various welding applications. Following a thorough examination and interpretation of the research study, it was determined that the Technology Management of inventive Water Welding Machines satisfies the necessary criteria and serves as a precise manual for entrepreneurship in the community.

The main purpose of the study was to fabricate and install the effectiveness of an innovative water Welding Machine for Entrepreneurship that can be used to aid the instruction of CTU-BIT students and for Entrepreneurship at the aforementioned University and the Municipality of Pinamungajan, Cebu. It is also considered an alternative technology tool in the place where the study is conducted. It benefited the instructional program of Cebu Technological University – Pinamungajan Extension Campus.

The University. After the prototyping stage comes the actual making of the effectiveness of an innovated water Welding Machine that could be done by a group of students working as a team, and this was placed in the vicinity itself for the use of the next and incoming students.

The instructors. The effectiveness of an innovative water Welding Machine contributes to the instructors' knowledge in innovating and creating new concepts in their field of specialization leading them to do further studies and improvements. With this, they can also arrange the competencies of producing this device for the students, constructing all parts of the project, and working as a group to arrive at the same output that could partly answer the need of providing 70 percent practical training and 30 percent theory.

The students. By making this effectiveness of an innovative water Welding Machine, the students gradually meet their level of competencies tailored to their particular knowledge, skills, and attitude. Because of their participation, they can acquire the basic skills in fabrication and understanding of Technology, operation guide of the innovation, and accurate and safe manner of working habits that could answer the need of the industry which is being encompassed by this device.

The Future Researchers. This study helped other researchers in conducting similar projects. Thus, the finished product inspired them to make a study for improvement.

It is recommended that the students, walk-in vendors, teachers, and other entrepreneurs adopt and fabricate the innovative water welding machine as their tools for making their own business.

Conflict of Interest: The authors declare no conflict of interest.

Ethical Approval: The study adheres to the ethical guidelines for conducting research.

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