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A survey to assess public perception of right to repair for electronic devices

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Abstract

The purpose of this research is to determine public opinion and knowledge concerning the concept of Right to Repair for electronic devices. Right to Repair encompasses many facets, including consumer rights, the environment, purchasing habits, legislation, and economics, and has recently encountered increased interest. We conducted a survey study to elicit what the public knows and feels about Right to Repair. Results suggest that consumers are generally supportive of Right to Repair practices for their electronic devices and believe that laws should be created to protect Right to Repair. We believe the results of this research can inform others or be used by lawmakers and activist groups to examine the repair aspect of the electronic computing industry.

Keywords: Right to Repair, Electronic Devices, Survey, Public Perception, Undergraduate Students

Introduction

The longevity of our electronic devices has a surprisingly big impact on many facets of our world: consumer rights, the environment, the economy, and even politics. The concept of Right to Repair aims to lengthen the lifespan of our electronic devices and has gained popularity among consumers, politicians, and media for its effect on all these aspects of our world (*Right to Repair*, n.d.).

Right to Repair is defined as the act of allowing consumers to modify or repair computer devices themselves or take it to a third-party repair center of their choice (*Right to Repair*, 2022). Not allowing Right to Repair means the manufacturer will require the consumer to use only the services provided or contracted by the manufacturer. Manufacturers may intentionally restrict access to tools and components or otherwise make it deliberately difficult or impractical for consumers to independently modify or repair devices.

In this research, we have set out to survey the public opinion on Right to Repair. Our survey explores the public's opinion on Right to Repair and how it relates to the environment, their purchasing habits, and lawmaking. We hope the results can be used to inform the public, lawmakers, and manufacturers and help us understand the current state of Right to Repair.

The rest of this paper is organized as follows: we review existing literature, including the history of Right to Repair; previous studies eliciting public perception; and current legislation surrounding the topic. The methodology of our research follows the literature. Results of our survey are then presented. Finally, we discuss research findings, implications, and future research.

Literature Review

Current State of Right to Repair

As it stands, the policy and regulation landscape for right to repair practices is primarily focused on medical devices, vehicles, and agricultural equipment. In February 2022, U.S. Representative Bobby L. Rush (D-IL) introduced the Right to Equitable and Professional Auto Industry Repair (REPAIR) Act to ensure that vehicle owners and independent auto repair shops have access to the same repair and maintenance tools as established dealerships. Similarly, considering the farmer protests that led to the recent John Deere lawsuits, U.S. Senator Jon Tester (D-MT) (2022) introduced the Agriculture Right to Repair Act, which allows farmers access to parts and updated software to repair their own equipment. Legislative actions and regulations for right to repair practices in manufacturing computing devices such as smartphones and computers, however, are few and far between. In June 2021, U.S. Representative Joseph Morelle (D-NY) introduced the Fair Repair Act, requiring “an original equipment manufacturer (OEM) to make diagnostic, maintenance, and repair equipment available to independent repair providers.” Although legislation like this has been crucial in fueling the right to repair movement for computing devices, and while the right to repair should not be a political issue, tech giants such as Apple and Microsoft have continually used their power and money to influence the political landscape. According to the U.S. Public Interest Research Group (2021), lobbying efforts against the right to repair have amounted to over \$10.7 trillion. Past studies on the right to repair have shown that a majority of consumers support the movement, while only trade associations and corporations stand in opposition of it (U.S. PIRG, 2021).

Past Studies on Right to Repair

An essay by Kyle Montello, in the *Tulane Journal of Technology and Intellectual Property*, states that the “main internal motivation for opposition [of right to repair] is economical.” Montello (2020) also wrote that although the opposition strongly claims that complications such as security risks, consumer safety concerns, and corporate liability are legitimate concerns for independent repair, they are mostly pretexted to protect profits gained from device upgrades.

Other major barriers to implementing right to repair practices include design strategies centered around planned obsolescence and the average consumer’s knowledge and perception of repair. Examples of planned obsolescence in product design include using lower-quality material and developing software only compatible with the latest models (Svensson-Hoglund et al., 2021). In an interview with Kyle Wiens, the CEO of iFixit, he states that product designers often sacrifice repairability for the sake of form factors such as thinness in laptops (Pierce, 2020). Additionally, fast product cycles, planned obsolescence, and peer influence fuel a throwaway culture that encourages purchasing new devices over repairing old ones. Previous studies have shown that consumers often do not regard refurbished or repaired products to be of equal quality to those of its brand-new counterparts (Svensson-Hoglund et al., 2021).

Our research aims to develop a knowledge and understanding of consumer perceptions of the right to repair and how this insight could address barriers and opportunities for repair activities. Additionally, we found that previous studies discussing the right to repair primarily focus on the policy and regulation landscape for manufacturers and the many market and design barriers that have prevented widespread regulations from taking place. There is a noticeable lack of studies for consumer perceptions on the movement and how right to repair practices could work with “green computing.” So, we hope that our survey research will open insightful discussions for lawmakers and activists alike to implement extensive environmental strategies in the computing industry, as well as explore legislative actions beneficial to consumers and small businesses rather than the corporations lobbying against the movement.

Methodology

This research examines public opinion over Right to Repair and how it impacts the environment, purchasing habits, and lawmaking. The survey is done online, shared through a recruitment page with information about the study, and a link to the Google forms Survey. No personal information was requested in the survey. This research was approved by the University’s Institutional Review Board.

The survey questions are divided into several sections: Demographics, Personal Preferences, Right to Repair, Right to Repair and Personal Preference, Right to Repair and Lawmaking, and Short Answer. Demographics includes age, gender, race, location, education, financial status, how proficient a participant considers themselves at repairing computer devices, number of computer science courses taken, and what the participant would do when a computer device breaks. The Preferences section asks participants how important they consider repairability when buying computer devices and their preferences for repairing broken devices between using third-party repair, the manufacturer for repair, or repairing the device themselves. Right to Repair and beliefs defines the Right to Repair, asks participants how they feel regarding right to repair and how it impacts the disposal, recycling, and electronic waste of computer devices, as well as if participants would buy computer devices where repairability was limited by the manufacturer. Right to Repair and Lawmaking asks participants if they believe that they should have the right to decide how to repair their own devices; if Right to Repair protects consumers’ rights, if participants feel more laws are needed to support Right to Repair practices; and if participants believe companies should be incentivized or mandated to adopt Right to Repair Practices. Finally, comments give participants an opportunity to share any thoughts over right to repair in an open-ended manner. A scale of 1 to 7 - with 1 being strongly disagree, 4 being neutral, and 7 being strongly agree - are used in all sections other than Demographics and Comments.

This survey was first given to a small pilot group of four volunteers. After this pilot group was conducted, the volunteers reported that they had no concerns about the survey, so we concluded that no changes were necessary.

Data acquisition was done online using Google Forms. A link to the survey with a short description of the survey was posted on social media platforms Facebook, Discord, and Reddit, and distributed via email to two Midwest universities. Personal accounts were also used to share the survey link to friends and acquaintances. Participants were also encouraged to share the link with others that may have been interested in taking the survey. Google Forms automatically records and displays survey results in a protected Google sheet only available to the researchers. Results were imported into Excel then analyzed using SPSS, a statistical analysis program developed by IBM.

Results

In this section, we report the results of our survey. First, we present the demographic information of the responses. Then, we report mean, standard error, and correlations of the survey results. Finally, we present results on group comparisons.

Our survey had a total of 138 responses. The respondents of our survey were moderately evenly distributed among male and female. Our locations, ethnicities, and ages, however, tended slightly toward certain regions. In the Proficiency in Electronics Repair section, participants rated themselves on a 1 to 7 scale, with 1 being not at all confident and 7 being highly confident. The first column of every section refers to the category, the second column to the number of respondents, and the third referring to the corresponding percentages. During analysis, some of these results were combined for simplified analysis; for example, the genders “other” and “prefer not to say” (PNTS) were combined. The results of our demographics section can be seen in Table 1.

Table 1: Demographics of Respondents

Gender			Location			Number of CS Courses			Ethnicity		
Male	74	53.6%	Midwest US	94	68.1%	0	61	44.2%	Caucasian	107	77.5%
Female	56	40.6%	Eastern US	19	13.8%	1 to 4	47	34.1%	Asian	16	11.6%
Other	4	2.9%	Outside US	16	11.6%	5 to 10	9	6.5%	African		
PNTS	4	2.9%	Western US	9	6.5%	10+	21	15.2%	American	8	5.8%
									Hispanic	7	5.1%
									Other	0	0%
Age			Repair Proficiency			Household Income			Education Level		
18-21	61	44.2%	1	27	19.6%	<\$20K	28	20.3	HS/GED	19	13.8%
22-24	29	21%	2	21	15.2%	\$20K - \$34K	19	13.8	Some		
25-29	18	13%	3	26	18.8%	\$35K - \$49K	14	10.1	College	56	40.6%
30-34	9	6.5%	4	21	15.2%	\$50K - \$74K	25	18.1	Associate’s	10	7.2%
35-39	6	4.3%	5	28	20.3%	\$75K - \$99K	22	15.9	Bachelor’s	37	26.8%
40-44	2	1.4%	6	8	5.8%	≥\$100K	30	21.7	Graduate	16	11.6%
45-49	4	2.9%	7	7	5.1%						
50+	9	6.5%									

Table 2 presents the mean and standard error for each survey question. The question labels in the table correspond to the questions in Appendix A. In the Proficiency section (P1), many respondents do not believe that they are proficient in electronics repair (mean = 3.39). In the Personal Preference section (PP1 – PP4), respondents strongly agree that repairability is important to them when making a purchase decision (PP1 mean = 5.48). In the Right to Repair section (R1 – R8), respondents very strongly agree that they should have the right to repair a computer device themselves (R3 mean = 6.55) or take it to a third party of their choice (R4 mean = 6.72). Many respondents disagree that the repair of a device by a third party costs the same as having it repaired by the manufacturer (R6 mean = 3.35). In the Right to Repair and Beliefs category (B1 – B5), respondents agree at least moderately with all statements (mean ≥ 4.6). In the Right to Repair and Lawmaking category (L1 – L5), respondents strongly agreed with all statements (mean ≥ 5.5) except L1, where they disagree that manufacturers have the right to decide how their devices *should* be repaired (L1 mean = 3.04).

Table 2: Basic Statistics

Q	Mean (SE)	Q	Mean (SE)	Q	Mean (SE)	Q	Mean (SE)	Q	Mean (SE)
P1	3.39(.15)	R1	4.57(.20)	R5	5.45(.13)	B1	6.17(.10)	L1	3.04(.15)
PP1	5.48(.14)	R2	6.20(.12)	R6	3.35(.14)	B2	5.85(.12)	L2	6.16(.11)
PP2	4.09(.16)	R3	6.55(.09)	R7	5.20(.13)	B3	6.10(.10)	L3	5.88(.11)
PP3	4.45(.15)	R4	6.72(.07)	R8	6.27(.10)	B4	4.62(.16)	L4	5.51(.13)
PP4	4.01(.18)					B5	5.01(.15)	L5	5.74(.12)

We are also interested in how questions are correlated to each other. We performed a Pearson Correlation Coefficient test to determine which questions had a strong correlation with others. If a Pearson Correlation has a value between +/-0.5 and +/-1, then it is considered a strong correlation. If the value lies between +/-0.30 and +/-0.49, then it is considered a medium correlation. If the value lies below +/-0.29, then it is considered a small correlation. When reviewing these statistics, some questions stood out with very high correlations. Questions B4 and B5 of the Right to Repair and Beliefs section had the strongest correlation with a Pearson correlation of 0.880. Questions R3 and R4 of the Right to Repair section also had a very strong correlation with an r-score (a measure of correlation with 1 being complete correlation) of 0.818. R3 also had a strong correlation with question R8, with an r-score of .732. Questions B1 and B3 had an r-score of 0.765. B3 also had a strong correlation with question B2, with an r-score of 0.739. Questions L3 and L4 of the Right to Repair and Lawmaking section had an r-score of 0.747. Table 3a is a summary of the 6 strongest correlations and Table 3b shows all correlations.

Table 3a: Pearson Correlation Coefficient

Questions	Pearson Coefficient
B4 & B5	0.880
R3 & R4	0.818
B1 & B3	0.765
L3 & L4	0.747
B2 & B3	0.739
R3 & R8	0.732

Table 3b: Correlations

	P1	PP1	PP2	PP3	PP4	R1	R2	R3	R4	R5	R6	R7	R8	B1	B2	B3	B4	B5	L1	L2	L3	L4	L5
P1	1	.325**	-.238**	-0.076	.623**	.378**	0.057	0.026	-0.004	0.027	-0.037	-0.056	-0.012	0.098	0.007	0.083	.195*	.178*	0.050	0.088	0.114	0.079	0.151
PP1	.325**	1	-.195*	0.010	.331**	.313**	.321**	.244**	.365**	.393**	0.098	.370**	.353**	.277**	.239**	.258**	.420**	.359**	-.239**	.327**	.366**	.333**	.345**
PP2	-.238**	-.195*	1	-0.115	-.426**	-.303**	-.310**	-.225**	-.182*	-.301**	0.130	-.308**	-.267**	-.353**	-.249**	-.326**	-.330**	-.278**	.315**	-.260**	-.309**	-.210*	-0.149
PP3	-0.076	0.010	-0.115	1	-0.054	-0.025	0.081	0.012	0.003	.242**	0.132	.287**	0.024	0.040	0.005	0.009	0.158	0.120	0.003	-0.046	0.065	0.108	-0.015
PP4	.623**	.331**	-.426**	-0.054	1	.411**	.259**	.265**	.193*	0.162	-0.082	.180*	.251**	.253**	0.131	.216*	.372**	.325**	-0.133	.331**	.328**	.200*	.338**
R1	.378**	.313**	-.303**	-0.025	.411**	1	.458**	.235**	0.120	.245**	0.053	0.167	.297**	.357**	.281**	.384**	.201*	.202*	-.196*	.291**	.429**	.422**	.305**
R2	0.057	.321**	-.310**	0.081	.259**	.458**	1	.591**	.472**	.418**	0.110	.391**	.656**	.506**	.482**	.546**	.316**	.297**	-.313**	.525**	.465**	.503**	.420**
R3	0.026	.244**	-.225**	0.012	.265**	.235**	.591**	1	.818**	.457**	-0.011	.451**	.732**	.556**	.464**	.487**	.298**	.298**	-.329**	.506**	.489**	.471**	.397**
R4	-0.004	.365**	-.182*	0.003	.193*	0.120	.472**	.818**	1	.425**	-0.018	.391**	.697**	.477**	.457**	.432**	.292**	.265**	-.307**	.426**	.472**	.411**	.401**
R5	0.027	.393**	-.301**	.242**	0.162	.245**	.418**	.457**	.425**	1	.236**	.707**	.526**	.459**	.418**	.372**	.489**	.415**	-.238**	.246**	.333**	.455**	.303**
R6	-0.037	0.098	0.130	0.132	-0.082	0.053	0.110	-0.011	-0.018	.236**	1	.198*	0.110	0.061	.172*	0.022	0.123	0.098	0.017	0.072	0.067	0.133	0.027
R7	-0.056	.370**	-.308**	.287**	.180*	0.167	.391**	.451**	.391**	.707**	.198*	1	.580**	.520**	.401**	.431**	.532**	.443**	-.218*	.308**	.359**	.427**	.343**
R8	-0.012	.353**	-.267**	0.024	.251**	.297**	.656**	.732**	.697**	.526**	0.110	.580**	1	.710**	.541**	.580**	.376**	.289**	-.320**	.487**	.599**	.555**	.497**
B1	0.098	.277**	-.353**	0.040	.253**	.357**	.506**	.556**	.477**	.459**	0.061	.520**	.710**	1	.649**	.765**	.398**	.351**	-.341**	.466**	.540**	.544**	.433**
B2	0.007	.239**	-.249**	0.005	0.131	.281**	.482**	.464**	.457**	.418**	.172*	.401**	.541**	.649**	1	.739**	.385**	.384**	-.275**	.418**	.529**	.594**	.437**
B3	0.083	.258**	-.326**	0.009	.216*	.384**	.546**	.487**	.432**	.372**	0.022	.431**	.580**	.765**	.739**	1	.436**	.406**	-.370**	.505**	.553**	.611**	.449**
B4	.195*	.420**	-.330**	0.158	.372**	.201*	.316*	.298**	.292**	.489**	0.123	.532**	.376**	.398**	.385**	.436**	1	.880**	-.174*	.369**	.419**	.406**	.331**
B5	.178*	.359**	-.278**	0.120	.325**	.202*	.297**	.298**	.265**	.415**	0.098	.443**	.289**	.351**	.384**	.406**	.880**	1	-.174*	.383**	.363**	.374**	.305**
L1	0.050	-.239**	.315**	0.003	-0.133	-.196*	-.313**	-.329**	-.307**	-.238**	0.017	-.218*	-.320**	-.341**	-.275**	-.370**	-.204*	-.174*	1	-.311**	-.402**	-.455**	-.238**
L2	0.088	.327**	-.260**	-0.046	.331**	.291**	.525**	.506**	.426**	.246**	0.072	.308**	.487**	.466**	.418**	.505**	.369**	.383**	-.311**	1	.596**	.501**	.559**
L3	0.114	.366**	-.309**	0.065	.328**	.429**	.465**	.489**	.472**	.333**	0.067	.359**	.599**	.540**	.529**	.553**	.419**	.363**	-.402**	.596**	1	.747**	.563**
L4	0.079	.333**	-.210*	0.108	.200*	.422**	.503**	.471**	.411**	.455**	0.133	.427**	.555**	.544**	.594**	.611**	.406**	.374**	-.455**	.501**	.747**	1	.516**
L5	0.151	.345**	-0.149	-0.015	.338**	.305**	.420**	.397**	.401**	.303**	0.027	.343**	.497**	.433**	.437**	.449**	.331**	.305**	-.238**	.559**	.563**	.516**	1

One of the survey questions we were quite interested in observing further is question R2: “I support right to repair.” This survey question had many interesting correlations with other questions; however, we have only selected four of them to explore further. Table 3c shows these correlations. Question R2 has a moderately strong negative correlation to question PP2: “When a computer device breaks, I would prefer to take it to the manufacturer for repair” (r-score = -.310). This implies that those respondents who support right to repair are less likely to take a computer device to the device’s manufacturer when it breaks. Another interesting correlation is with R8: “I believe manufacturers should choose to support right to repair” (r-score = .656). These two questions were correlated in a way that we expected: if a consumer supports right to repair, they are much more likely to believe that a manufacturer should choose to support it as well. Question R2 is also strongly and positively correlated with B3: “I believe Right to Repair means less electronics waste” (r-score = .546). This suggests that respondents who are more familiar with right to repair are more under the assumption that, if they were to take their device to the original manufacturer, it would produce more electronics waste than if they took it to a third-party or did it themselves. Finally, R2 is strongly positively correlated with question L2: “I believe Right to Repair protects consumer rights” (r-score = .525). Respondents believe that consumers rights are intertwined with right to repair practices.

Table 3c: Interesting Correlations of R2

Questions	r-score
R2 & PP2	-0.31
R2 & R8	0.656
R2 & B3	0.546
R2 & L2	0.525

We would like to know whether a person’s characteristics such as gender, race, income, and number of computer science courses taken influenced their choices. First, we looked at gender. We decided to omit

the responses of the groups labeled other and prefer not to say, as they only made up 8 of our total 138 responses. We identified no discernable fluctuations between these omitted groups and the others, so we decided to simply leave them out. We used an independent sample t-test to compare survey responses between the two gender groups, male and female.

For the following three tables, all highlighted and bolded cells are questions with statistically significant differences among their relevant characteristics. Table 4 presents a summary of the mean, mean difference, t-value, and p-value for each question split into the two gender groups. Table 4 shows that there are statistically significant differences between the two gender groups on most personal preference questions ($p\text{-value} \leq 0.05$), with one exception: PP3. In the Right to Repair section, only two questions had statistically significant ($p\text{-value} \leq 0.004$) differences: R1 and R2. In the Right to Repair and Beliefs section, there is no difference between the two gender groups on any of the questions ($p\text{-value} > 0.05$). The means of both groups in this section did not drop below 4.25, indicating that both groups, on average, moderately agree with the questions. In the Right to Repair and Lawmaking section, two of the questions (L2 and L3) show statistically significant differences between the two gender groups. While L4 and L5 are close to the threshold of being statistically significant, they are .02 above the cutoff point.

Table 4: Gender Mean Group Comparison

Q	Male	Female	Mean Diff.	t-value	p-value	Q	Male	Female	Mean Diff.	t-value	p-value
	Mean	Mean					Mean	Mean			
PP1	5.72	5.05	0.66	2.250	0.026	R8	6.36	6.04	0.33	1.589	0.115
PP2	3.68	4.71	-1.04	-3.223	0.002	B1	6.28	5.91	0.37	1.841	0.068
PP3	4.41	4.45	-0.04	-0.136	0.892	B2	5.92	5.61	0.31	1.294	0.198
PP4	4.68	3.13	1.55	4.411	0.001	B3	6.22	5.82	0.39	1.816	0.072
R1	5.53	3.41	2.12	5.386	0.001	B4	4.77	4.25	0.52	1.564	0.120
R2	6.47	5.75	0.72	2.904	0.004	B5	5.18	4.61	0.57	1.785	0.077
R3	6.59	6.46	0.13	0.720	0.473	L1	2.97	3.20	-0.22	-0.713	0.477
R4	6.68	6.73	-0.06	-0.374	0.709	L2	6.39	5.75	0.64	2.842	0.005
R5	5.54	5.23	0.31	1.140	0.256	L3	6.08	5.45	0.63	2.829	0.005
R6	3.51	3.09	0.42	1.442	0.152	L4	5.66	5.16	0.50	1.807	0.073
R7	5.22	5.04	0.18	0.679	0.498	L5	5.86	5.43	0.44	1.783	0.077

Table 5 shows differences between the two largest groups in our Yearly Combined Household Income category. In this section, we decided to group all responses into two groups: $< \$50,000$ and $\geq \$50,000$. We made this the division point as the 2020 median household income (U.S. Census 2021) was \$67,521 in the U.S. As this was the closest point to the national median, we chose that as our two groups.

Table 5 presents a summary of the mean, mean difference, t-value, and p-value for each question split into the two income groups. Table 5 shows that there are statistically significant differences between the two ethnicity groups on a single question from the Personal Preference section: PP3 ($p\text{-value} = 0.013$). The mean difference of 0.72 indicates those who make less than \$50,000 annually are more likely to take their device to a third-party in the event of breakage. In the Right to Repair and Beliefs section, both B4 and B5 had statistically significant differences ($p\text{-value} \leq 0.045$). In the Right to Repair and Lawmaking section, L1 was the only question to have a statistically significant difference ($p\text{-value} = 0.019$).

Table 5: Yearly Combined Household Income Mean Comparison

Q	Income 1	Income 2	Mean Diff.	t-value	p-value	Q	Income 1	Income 2	Mean Diff.	t-value	p-value
	Mean	Mean					Mean	Mean			
PP1	5.59	5.34	0.25	0.863	0.389	R8	6.11	6.39	-0.27	-1.392	0.166
PP2	4.02	4.14	-0.13	-0.393	0.695	B1	6.07	6.25	-0.18	-0.929	0.355
PP3	4.85	4.13	0.72	2.521	0.013	B2	5.87	5.83	0.04	0.162	0.871
PP4	4.05	3.99	0.06	0.170	0.865	B3	6.05	6.14	-0.09	-0.446	0.656
R1	4.56	4.58	-0.03	-0.064	0.949	B4	4.98	4.34	0.65	2.027	0.045
R2	5.97	6.38	-0.41	-1.701	0.091	B5	5.48	4.64	0.84	2.775	0.006
R3	6.44	6.64	-0.19	-1.135	0.258	L1	3.44	2.73	0.72	2.374	0.019
R4	6.66	6.77	-0.11	-0.777	0.438	L2	6.10	6.21	-0.11	-0.495	0.621
R5	5.46	5.44	0.02	0.067	0.946	L3	5.74	5.99	-0.25	-1.126	0.262
R6	3.43	3.29	0.14	0.489	0.626	L4	5.36	5.62	-0.26	-0.981	0.328
R7	5.38	5.06	0.31	1.228	0.222	L5	5.66	5.81	-0.15	-0.631	0.529

*Income 1= <\$50,000, Income 2= ≥\$50,000

Table 6 shows differences between the two largest groups in our Age category. We placed the cutoff point for the two age ranges between 22-24 and 25-29. We saw that there was a roughly even distribution between those between 18-24 and those 25+.

Table 6 presents a summary of the mean, mean difference, t-value, and p-value for each question, split into the two groups. Table 6 shows that there are no statistically significant differences between the two groups on Personal Preference questions. Table 6 shows that there were statistically significant differences on three questions in the Right to Repair section: R2, R3, and R5 (p-value ≤ 0.029). In the Right to Repair and Beliefs category, there was one statistically significant difference: B1 (p-value = 0.037). There were two statistically significant differences in the Right to Repair and Lawmaking category: L1 and L4 (p-value ≤ 0.045).

Table 6: Age Mean Comparison

Q	Age 1	Age 2	Mean Diff.	t-value	p-value	Q	Age 1	Age 2	Mean Diff.	t-value	p-value
	Mean	Mean					Mean	Mean			
PP1	5.37	5.59	-0.22	-0.709	0.480	R8	6.19	6.46	-0.27	-1.291	0.199
PP2	4.27	3.72	0.55	1.638	0.104	B1	6.03	6.43	-0.40	-1.965	0.037
PP3	4.41	4.48	-0.07	-0.216	0.830	B2	5.79	5.98	-0.19	-0.774	0.440
PP4	4.01	4.11	-0.10	-0.253	0.801	B3	6.02	6.28	-0.26	-1.184	0.239
R1	4.33	4.98	-0.64	-1.455	0.148	B4	4.53	4.87	-0.34	-0.987	0.326
R2	6.00	6.57	-0.57	-2.225	0.028	B5	4.99	5.13	-0.14	-0.433	0.666
R3	6.43	6.78	-0.35	-1.942	0.029	L1	3.37	2.39	0.98	3.100	0.002
R4	6.66	6.85	-0.19	-1.278	0.203	L2	6.13	6.26	-0.13	-0.548	0.585
R5	5.18	5.96	-0.78	-2.925	0.004	L3	5.78	6.13	-0.35	-1.530	0.128
R6	3.26	3.52	-0.27	-0.871	0.385	L4	5.32	5.89	-0.57	-2.025	0.045
R7	5.07	5.46	-0.39	-1.445	0.151	L5	5.84	5.57	0.28	1.117	0.266

*Age 1= 18-24, Age 2= ≥ 25

Group comparisons were also run on a participant's number of computer science courses taken, but not enough statistically significant differences were found to explore further. Group comparisons were run on

a participant's ethnicity; however, as mentioned in the Results and Limitations section, our results were deemed too skewed toward Caucasian participants to be used.

At the end of the survey, we allowed respondents to comment. This provided respondents an opportunity to give qualitative feedback on their opinions on the current state and future state of the right to repair movement. We received 20 user comments. 8 of these comments were removed due to irrelevance to our topic or were too short for meaningful analysis. These comments are shown in Appendix B.

Discussion

Our survey was aimed to probe the general Populous about how they felt about the Right to Repair movement regarding purchasing habits, environmental impact, and lawmaking. Our study allows general consumers to have a greater voice about how lawmakers and manufacturers act moving forward by giving unique insight into the Right to Repair movement.

A 1 to 7 scale (strongly disagree to strongly agree) is used to determine intensity of feelings towards responses. A 5.48 mean in response to whether respondents consider repairability important when purchasing computer devices suggests that respondents are moderately inclined to consider repairability when purchasing devices. Question R2 asks respondents if they support Right to Repair and resulted in a mean of 6.20, suggesting that respondents are very supportive of Right to Repair.

Respondents not only support Right to Repair but believe that Right to Repair protects consumer rights (question L2, mean of 6.12). Furthermore, respondents also believe that more laws and regulation are needed to support Right to Repair practices (question L3, mean of 5.88), including incentivizing manufacturers to follow Right to Repair practices (question L4, mean of 5.51). Regarding the environment, respondents generally believe that Right to Repair leads to less throwing away of electronics, more recycling, and less electronic waste (questions B1, B2, B3 with means of 6.17, 5.81, and 6.10).

Correlations can also be analyzed to see if a particular response to one question may suggest respondents' feelings on another question. The highest correlation surfaced (0.880) between questions asking respondents if they would purchase a computer device that had its repairability limited by manufacturers (question B4) and asking if respondents believe repairing devices via third-party repair is as secure as having the manufacturer repair devices (question B5). This suggests that respondents that are conscious of manufacturers limiting repairability may be more confident in taking their device to a third party for repair rather than going to the manufacturer for repair or purchasing a new device.

Respondents who identify as male (versus female) show statistically significant differences in the way they respond to questions regarding personal preferences. Male respondents feel more strongly than their female counterparts about the importance of repairability of their devices; support for taking their devices to the manufacturer for repair; and repairing devices themselves (questions PP1, PP2, PP4). Furthermore, male respondents are more familiar with the idea of Right to Repair and more strongly support the idea of Right to Repair (questions R1 and R2).

Older respondents (25+ versus <=24) may be more likely to support Right to Repair than their younger counterparts. A statistically significant difference in means is noted when asked if respondents support right to repair (questions R2, R3), and older respondents believe more strongly that manufacturers should be persuaded into adopting Right to Repair practices (L1, L4).

Twenty comments were left, twelve of which are relevant to discussion. One comment suggests that the Right to Repair your own devices is engrained in American cultural values, while another commenter who reports that he/she works in the tech and repair industry, suggests that it is an inherent right in the industry that must be protected as electronics continue to become more important in every market. Eight commenters explicitly support Right to Repair while two comments offered concerns about Right to Repair. One suggests that creating laws and standards behind Right to Repair may hinder technological advancement in the future, as imposing laws and limitations may disincentivize innovation. The other comment suggests that passing laws is not the best way to implement Right to Repair as forcing manufacturers to comply may increase costs to the consumer but suggests that advocating for consumers to support businesses that choose Right to Repair practices is an ideal alternative to not constraining increased costs to all consumers.

Conclusion, Limitations, and Future Research

This research studies consumers' perception of Right to Repair and how it impacts purchasing. We conducted a survey that was distributed over social media. Analysis of the data shows that people are very supportive of the Right to Repair movement. Furthermore, respondents generally believe supporting Right to Repair is beneficial to the environment, feel that lawmakers need to take actions to support Right to Repair, and prefer purchasing products from manufacturers that support Right to Repair.

The results of this research could be used by activist groups and lawmakers to introduce new legislations that will benefit the Right to Repair movement. Electronic device manufacturers may use this research to influence product design and strategies for their products. Scholars and researchers can also use the results of this research to support and guide future research on this topic.

Our research has some limitations. The largest limitation is the sample size of 138 respondents. Without a larger sample size, it is difficult to generalize public opinion. Ethnicity, location, and age were another limitation. In particular, 77% of respondents identified themselves as Caucasian, 64% of respondents were under 25, and 67% of respondents were from Midwest U.S. A more diverse sampling group would give a better picture of the overall public opinion regarding right to repair.

Future research could focus on the relation between Right to Repair and the environment by investigating how the reparability of devices impacts consumer behavior regarding repairs, recycling, and disposal of computer devices. Future research could also investigate how manufacturers supporting Right to Repair impacts consumers' purchasing habits further and take a more detailed look at consumers' preferences in situations where they are considering repairing a device versus purchasing a new device.

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Appendix A: Survey Instrument

Proficiency in Electronics Repair: 1 (Not at all Confident) to 7 (Highly Confident)

P1: Proficiency in electronics repair

Personal Preference: 1 (Strongly disagree) to 7 (Strongly agree)

PP1. Repairability is important to me when I purchase computer devices.

PP2. When a computer device breaks, I would prefer to take it to the manufacturer for repair.

PP3. When a computer device breaks, I would prefer to take it to a 3rd party for repair.

PP4. When a computer device breaks, I would attempt to repair it myself.

Right to Repair: 1 (Strongly disagree) to 7 (Strongly agree)

R1. I am familiar with the idea of Right to Repair.

R2. I support Right to Repair.

R3. I should have the right to repair a computer device myself.

R4. I should have the right to take a computer device to the repair shop of my choice.

R5. I believe repairing a computer device by a 3rd party is as secure as the manufacturer.

R6. I believe repairing a computer device by a 3rd party costs the same as the manufacturer.

R7. I believe repairing a computer device by a 3rd party is of the same quality as the manufacturer.

R8. I believe more manufacturers should choose to support Right to Repair

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Right to Repair and Beliefs: 1 (Strongly disagree) to 7 (Strongly agree)

B1: I believe Right to Repair means less throwing away.

B2: I believe Right to Repair leads to more recycling.

B3: I believe Right to Repair means less electronics waste.

B4: I will not purchase a computer device if the manufacturer intentionally limited my ability to repair it myself.

B5: I will not purchase a computer device if the manufacturer intentionally limited my ability to take the device to a repair shop of my choice.

Right to Repair and Lawmaking: 1 (Strongly disagree) to 7 (Strongly agree)

L1: I believe manufacturers have the right to decide how their devices could be repaired.

L2: I believe Right to Repair protects consumer rights.

L3: I believe more laws and regulations are needed to support Right to Repair practices.

L4: Companies should be mandated by law to adopt Right to Repair practices.

L5: Lawmakers should incentivize manufacturers to adopt Right to Repair practices.

Appendix B: Survey Comments

1	I have done smaller repairs on my own, but for any significant repair I would take it to a professional. I don't recall ever taking a device back to a manufacturer simply because I am not near any manufacturer shops and I usually rely heavily on my devices and can't part with them long enough to ship.
2	Right to Repair is something that I am very familiar with. I'm still using the same cell phone that I got from my parents around 2015 (which has a replaceable battery). I've had to replace the battery once since getting the phone. I also build my own desktop computers using standardized parts that can be swapped out if one component fails. I am not familiar with making repairs involving individual capacitors, traces, chips, etc... but if the device I would fix is expensive enough I would try to repair it this way before doing something else. My overall opinion on the matter is that if the consumer wants to repair the device (or have it repaired by a third party) they should be able to do so without the manufacturer getting in the way. It's the consumer's (or third party's) responsibility to take on the risks involved with the repair of the device. Most of the comments I've heard from manufacturer's [sic] who oppose Right to Repair revolves around security and safety, making it sound more dangerous than it really is. I think this is fearmongering, and our government officials should be smart enough to see through this. But this comes back to lobbyists and corruption, which I don't want to get into here. I could go on and on, but I think you get what my opinion on Right to Repair is.
3	Right to Repair mandates MUST be paired with Design for Repair mandates to be effective. Manufacturers will simply make things unrepairable if this requirement is not included.
4	Manufacturers should be penalized, not incentivized, for disallowing right to repair.
5	I believe right to repair is a value Americans cherish. Ever since our founding we have valued repairability and are quick thinking when faced with repairs. Mega corps shouldn't decide who can repair what just [on] basis of profits. In addition, denying right to repair hurts consumers by promoting disposable, and intentionally short lifespan devices, leading to more waste, higher security risks, and more expensive costs for devices people need.

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6	as someone who has worked in tech and repair nearly my whole life, this is a necessity as we move forward in a more tech dominated age, from farm equipment to phones.
7	Companies should not be able to control what happens to their devices after the initial sale/purchase of the item. Once it is sold to the consumer, the consumer owns the rights to that device's parts, including being able to purchase repair parts if something is broken or needs replaced.
8	I do think cost and time plays a big part in this. If it is cheaper or similar in price to repair a device I would probably purchase something new.
9	I don't think that laws and regulations are always the right answer to these issues because they can lead to time and money leading to that cost being passed on to the consumers-us. Advocating for consumer choice and manufactures choosing 3rd party repair businesses that do an excellent job in a timely manner which limits cost is also important.
10	The biggest concern that I have is that manufacturers might be required by the government to keep a standard in place (IE: EU requiring all devices to support USB-C, article link: https://www.cnbc.com/2021/09/23/eu-plans-to-make-usb-c-mandatory-for-apple-iphones-and-other-devices.html) while this is good now, new formats might come into play later that would be better than USB-C, but then they are disincentivized from innovating/trying new things since law requires USB-C, perhaps a transfer 40Gbps is fast now, but with computing continue to grow in bandwidth each year this might soon be obsolete. Without sunset clauses these laws will likely do more to hurt consumers than help them.
11	Typically, the reason manufacturers require [their] own support is because they can guarantee the service is done correctly. The manufacturer cannot guarantee the quality of an unknown 3rd party or a self-repair. I know myself personally knows nothing about the inner workings of a computer, so I don't trust myself to do the repair. That being said, I know a few people who know how those things work. They should have the ability to repair [their] own computing device without fear of law. Tldr [too long, didn't read], voiding warranty makes sense. If for fear of law, that should not stand.
12	I didn't know this was a current issue! And I'm afraid I am not super aware of the status quo on repair rights. I haven't had issues in my experience, and I have been able to attempt my own repair or take to a third party for repair. So, I'm guessing manufacturers are pushing for their right to restrict repair? And this is a response to that?