

Statistical Package for Social Sciences Acceptance in Quantitative Research: From the Technology Acceptance Model's Perspective

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Today, education, medicine, business, and all other fields rely heavily on computers. This reliance is increased much when both professionals and academic level students have to conduct research projects. This reliance is indicated by the availability and utility of the software, which is an integral part of computer technology. Hence, by keeping in view the importance of SPSS in research, we scrutinized the significant factors behind Statistical Package for Social Sciences (SPSS) adoption and acceptance. We executed an experimental approach and gathered data from $n= 300$ young researchers studying in the $n= 4$ public sector universities in Rawalpindi and Islamabad, Pakistan. By adopting the primary variables from the Technology Acceptance Model, we proposed and a study model and examined it by using Smart-PLS. Findings showed that perceived ease of use and usefulness are significantly associated with Quantitative Research. Here, perceived ease of use and usefulness also indicated their interrelationship to validate the technology acceptance further. As a result, we also found a significant relationship between perceived usefulness, perceived usefulness, and SPSS technology acceptance. In simple terms, ease of use and valuable outcomes are the primary reasons behind SPSS acceptance among Pakistani students. Thus, we conclude that today, when technology has facilitated all the fields of life, research and development is another major field that is availing enormous advantages from the technology acceptance, integration, and execution. We recommend that SPSS usage should be encouraged for research purposes. Educational institutions should introduce new courses regarding SPSS learning and use them to further increase quantitative research aptitude among students.

Keywords: technology acceptance, statistical package for social sciences, quantitative Research, Education, SPSS acceptance

Research is a systematic process that involves proposing an idea, supporting the propositions, evaluating and validating the research problem. Research also suggests new facts and reaches unique conclusions. The primary tenet of research involves data gathering, information, and observations to advance our knowledge and expertise (Ahmad, 2016). We can also define research as investigating the subject in detail, discovering new information, and exploring our advanced understanding of an existing

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phenomenon (Singh, 2021). Here SAGE, (2018) described the research as a process of differentiating between valid and invalid. For instance, when a doctor has to treat his patients, he will consider gaining information and guidance from scientific knowledge. This scientific knowledge is gathered from valid platforms that professional researchers authenticate. It is also notable that research is conducted for academic and professional purposes. For example, students perform research to complete their degree programs in academics. In this regard, instructors researched for promotional purposes.

On the other hand, business researchers perform research to examine the marketing trends, challenges and attain product response/ feedback (Govoni, 2012). Overall, research is one of the most critical components, responsible for proposing new ideas and advancing the existing ones. Significantly, today, when academic and professional arenas are expanding, new challenges are arising, and recent trends are expanding, research provides complete guidelines and supports coping with the challenges and increasing knowledge efficiently (Defazio et al., 2010).

In this regard, quantitative research is one of the most preferred techniques, leading to generalizable outcomes. The research gathered data and allocated codes (numbers) to perform the statistical analysis in quantitative research. This statistical analysis provides a pathway to ensure the validity and accurateness of the results by using both inferential and descriptive statistics (Daniel, 2016; Khan et al., 2020). Apuke (2017) noted that researchers primarily gather numeral data and then make the relevant calculations. The purpose is to quantify the data and conduct the statistical examination to accept or reject the hypothesized statements. Likewise, research is also a fundamental part of academic and professional life in Pakistan, like other countries. Students and professionals researched both collective and individual levels. We have different private and government sector organizations that fund the research projects here. Besides, academic research is also common to enhance students' critical thinking and writing abilities.

Moreover, research for promotional purposes is another primary reason behind conducting individual and academic research in Pakistan (Ansari et al., 2016). During the educational journey, universities focus on teaching the student about all the essential techniques that are trending in researching the educational journey. For instance, university-level students in Pakistani are obligated to opt for the course specialized for teaching quantitative research methods. As a result, students learn new techniques, including research writing, data manipulation, data gathering, and even data analysis, using advanced software such as Statistical Package for Social Sciences (Arkkelin, 2014). Undoubtedly, computer technology has largely facilitated almost every field of life. Especially the use of computers in research is substantial, which involves different computer-based programs such as Statistical Package for Social Sciences that helps to perform complex numerical tasks that are difficult and time-consuming.

Consequently, Statistical Package for Social Science has done quantitative research fast, efficient, reliable, validated, and easily generalizable (Kpolovie, 2017). Moreover, Statistical Package for Social Sciences (SPSS) is considered part of technology-enhanced learning that further validates its relevance with the technology

acceptance model proposed by Fred D. Davis, (1980). As noted by Brezavšček et al., (2014), Statistical Package for Social Sciences (SPSS) provides students to alleviate their complex statistical issues. Today, more than 80% of students face statistical anxiety and frustration due to complex statistical requirements in research. However, SPSS is one cost-effective and widely available softwares that students can access and use to meet their study requirements.

Thus, by considering the role and importance of the Statistical Package for Social Sciences in the research, the current article also focuses on the dynamic reasons behind increased SPSS usage among university students. However, up till now, examining the SPSS usage in terms of technology acceptance is a much-underrepresented phenomenon, indicating an explicit research gap in the relevant arena. Hence, the first section discussed the importance of research and study problem. The second section involves citing the literature and proposing the research hypotheses. In the third section, the researcher highlighted the primary methods used in this research. In the fourth section, the study involves data analysis. In the fifth section, we have extensively discussed the results and the proposed reasons behind SPSS usage among students in its relevance with the Technology Acceptance Model.

Literature Review and Hypotheses Development

A. Quantitative Research, Perceived Ease of SPSS, & Usefulness

Many studies witnessed technology usage in learning and research arenas, facilitating students and researchers at almost every level. Students much know and acknowledge using technology such as computers, the internet, artificial intelligence, and even offline software to conduct different projects, assignments, and research studies (Alnaser et al., 2020). This acceptance and acknowledgement are directly linked with the "Perceived Ease of Use". Like internet technology, offline software also ensures maximum benefits with minimum complexity and increased trialability (Alhumaid et al., 2020). As a result, when students have to deal with complex data and statistical processes, they prefer using Statistical Package for Social Sciences (SPSS), which is easy to use, and affordable for everyone (Arkkelin, 2014). It is also notable that using computer-based software for research purposes decreases statistical anxiety and stress among the learners. Besides descriptive, the Statistical Package for Social Sciences also helps perform the inferential statistics, further enhancing its significance in the research studies (Brezavšček et al., 2014; Hinduja et al., 2020).

Similarly, increased research demand has also increased in almost every discipline. Conducting complex statistical equations by hand is a conventional and time-taking task. Also, the accuracy of results is sometimes questioned, which further demands approved software for availing validated results (Ahmed, 2009). Motivating students for the SPSS usage indicates an increased interest in researching different disciplines. Universities actively conduct special workshops to teach students SPSS for research purposes. The goal is to enable the students to research, leading to an increased research aptitude (Afari-Kumah & Achampong, 2010).

H1a: There is a significant relationship between quantitative research and ease of use

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H1b: There is a significant relationship between quantitative research and SPSS usefulness

B. Perceived SPSS Ease of Use and Usefulness

According to Hanafi and Fadilah, (2017), every discipline has several sub-disciplines that involve several research methods and techniques. As all fields rely on experimental research and empirical evidence, depending on the Statistical Package for Social Sciences (SPSS) is inevitable. Although qualitative research is also essential in proposing new ideas and validating existing ones, quantitative analysis has distinguished significance. For instance, the Biomedical Sciences students widely use SPSS to manipulate statistical and epidemiological data on an almost daily basis. Using SPSS is directly related to the acceptance of SPSS as a computer-based program to calculate statistical data and attain valid results (Perry et al., 2014). A study conducted by Šebjan, (2014) also affirmed the relationship between SPSS usage and quick results in Slovenia. The close-ended questionnaires showed a strong, positive relationship between SPSS Usage and perceived usefulness. Even institutions also offer online availability of SPSS usage guides and manuals, making it accessible. Consequently, the students utilize SPSS to perform statistical calculations, leading to authenticated results (Garth, 2008).

H2: There is a significant relationship between ease of use and SPSS usefulness

C. Perceived Ease of Use, Perceived Usefulness, & SPSS Acceptance

Statistical Package of Social Sciences (SPSS) is easy to use, ensuring the benefits of the analysis through simple methods. Although much other software helps the researchers perform statistical calculations, SPSS is the preferred one (Gogoi, 2020). It is also notable that International Business Machines Corporation (ISM) constantly updates the SPSS, adding more features to the software. Indeed, it is a complete package that provides a simple solution to complex statistical problems (Kpolovie, 2017). The measure of Central Tendency, Correlation, Covariance, even table, and graph-making tasks are efficiently conducted through SPSS.

Similarly, when it is about inferential statistics, several tests such as Analysis of Variance, Regression, Correlation, and others are simple and easy, indicating an increased SPSS usage among academic researchers (Rna, 2013). A cross-sectional study conducted by (Begum & Ahmed, 2015) also examined the reasons behind SPSS acceptance and usage among college-level students in India. Results also indicated that managing data and further analyzing with simple techniques are the essential factors attributed to SPSS acceptance among the researchers. Therefore, quantitative research in almost all study discipline is mandatory. If researchers manage the gathered data and calculate it manually, it takes much time and effort. However, the increased use of computer-based technology has largely facilitated quantitative research as it provides easy-to-use solid and reliable features and can attain statistically valid results (Huizingh, 2012).

H3: There is a significant relationship between ease of use and SPSS acceptance

H4: There is a significant relationship between perceived usefulness and SPSS acceptance

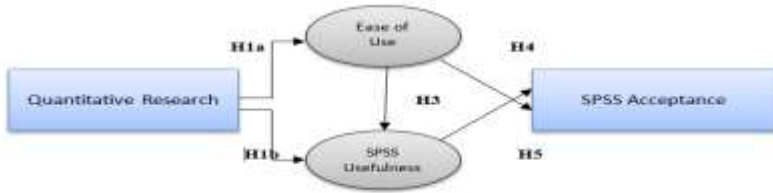


Figure 1: Conceptual Framework

The conceptual Framework in current research is primarily supported by Technology Acceptance Model proposed by Fred, (1980). According to Fred, (1980), Technology Acceptance Model validates the motivational factors that accelerate technology acceptance and usage among the potential users. TAM factors include Perceived ease of use, Perceived usefulness, behavioural intention and finally, technology adoption. These motivational factors are causal determinants of accepting technology as a regular part of your everyday life (Cebeci et al., 2019). In this context, Brezavšček et al., (2014) argued that Statistical Package for Social Sciences (SPSS) also contains similar characteristics that accelerate its adoption and usage among young researchers, particularly academic level researchers and students. Research students feel capable of fulfilling their learning objectives and an easy yet comprehensive way to meet their educational requirements. Abasalt et al. (2012) noted that applying technology-enhanced tools in research provides more advanced and better opportunities to students. Earlier, despite students having many options to perform complex statistical analyses, today softwares like Statistical Package for Social Sciences (SPSS) have facilitated much with solving the complex statistical problems.

Method

This investigation is a cross-section approach involving data gathering through self-designed structured questionnaires that were further examined using Composite Reliability, Convergent Validity and Discriminant Validity analyses. We selected young students from different universities and distributed close-ended, structured questionnaires for the data gathering process. However, the response rate was 95.3% ($n = 286$) as 4.6% ($n= 14$) questionnaires were wrong or incompletely filled. Hence, we performed the statistical analysis to validate the relationship between study variables after data gathering. We used both SPSS and AMOS for the Structural Equation Modelling to affirm the authenticity of the conceptual model as suggested by Al-Sarayrah et al., (2021). Structural Equation Modelling supported the study proposition by indicating the strong predictive power of conceptual models and hypotheses discussed later.

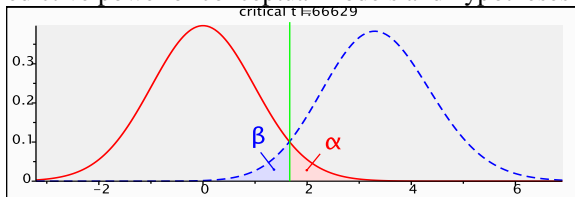


Figure 2: G* Power for the Sample Size Calculation

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Population and Sampling

The current study population comprises university-level social sciences students from all over Pakistan. However, according to the research criteria, we selected $n= 4$ public sector universities out of total $n= 32$ institutions currently working in Rawalpindi and Islamabad. Further, by using the simple random sampling method, we selected a sample of selected $n= 300$ participants from undergraduate, graduate and postgraduate levels. S. Ahmed (2009) noted that simple random sampling is one of the most preferred sampling techniques. It does not involve researchers' own bias and ensures the generalizability of the gathered results. However, it is notable that we first used G* Power Analysis to examine an ideal sample size for the current research. As shown in figure 2, the G* Power analysis calculated a perfect sample should be $n= 74$ participants. Yet we randomly selected $n= 300$ individuals as a primary sample size requirement in Structural Equation Modelling, which is an ideal sample size according to the G* Power criteria.

Demographics of Study Participants:

After calculating the frequency and percentage of the demographical data, we found that the majority of respondents ($n= 238$ or 83.2%) were males, and $n= 48$ or 16.8% were females ($M= 1.17$, $SD= .374$). Similarly, according to the age of the respondents, $n= 76$ (26.5%) were 18-22 years old, $n= 112$ (39.1%) were 26-28 years old, $n= 65$ (22.7%) were 23 to 25 years old, and $n= 33$ (11.5%) were 31 years old or above ($M= 3.77$, $SD= 1.231$). Moreover, $n= 85$ (29.7%) students were doing Masters, $n= 80$ (28.0%) were Doctorate level students, $n= 62$ (21.7%) of participants were under graduate level students, and $n= 59$ or 20.6% were graduation level students ($M= 2.64$, $SD= 1.108$). Table 1 summarizes the details regarding demographics of participants:

Results

Table 1
Demographics of Study Participants

<i>Variable</i>	<i>Constructs</i>	<i>f</i>	<i>%</i>
Gender	Male	238	83.2%
	Female	48	16.8%
Age	18-22	76	26.5%
	23-25	65	22.7%
	26-28	111	39.1%
	29-30	0	0.0%
	31 years or Above	33	11.5%
Qualification	Undergraduate	62	21.7%
	Graduate	59	20.6%
	Masters	85	29.7%
	Doctorate	80	28.7%

Convergent and Discriminant Validity Assessments:

We examined our research model's construct reliability and validity, recommended by (Mello & Collins, 2001). As given in Table 2, our Cronbach Alpha Values range from .715 to .853, which are higher than the designated value of .7. Likewise, the Composite Reliability Values range from .77 to .921, indicating the values exceeding the designated value of .7. Thus, we conclude that the Construct Reliability is

successfully validated. Moreover, we utilized Factor Loading values and Average Variance Extracted Values (AVE) to assess the convergent validity. Here we found that the AVE values range from .776 to .887, indicating these are successfully surpassing the threshold values and, therefore, stabling the convergent validity.

Table 2
Convergent Validity Assessment

	<i>ITEM</i>	<i>FL</i>	<i>CA</i>	<i>AVE</i>	<i>CR</i>
Quantitative Research	QRH1	.807			
	QRH2	.934	.715	.859	.899
	QRH3	.711			
	QRH4	.985			
Ease of Use	EAU1	.911			
	EAU2	.833	.853	.887	.921
	EAU3	.956			
	EAU4	.850			
SPSS Usefulness	SPU1	.901			
	SPU2	.809	.831	.848	.884
	SPU3	.860			
	SPU4	.824			
SPSS Acceptance	SPA1	.799			
	SPA2	.802	.822	.776	.777
	SPA3	.721			
	SPA4	.783			

Furthermore, we also determined the discriminant validity using Fornier-Larcker and Heterotrait-Monotrait Ratio scales (ZAITI & BERTEA, 2011). As seen in Tables 3 & 4, the square root of the values related to Average Variance Extracted (AVE) is higher than the structural correlation values, indicating that the discriminant validity is partially established. Similarly, after calculating the averages of all the variables and using the HTMT scale, we found the value of .205, which is smaller than the value of .85, indicating that the discriminant validity is successfully established (Mohajan, 2017).

Table 3
Discriminant Validity: Fornier Larcker Scale

	<i>QRH</i>	<i>EAU</i>	<i>SPA</i>	<i>SAP</i>
<i>QRH</i>	.737			
<i>EAU</i>	.547	.786		
<i>SPU</i>	.321	.701	.719	
<i>SAP</i>	.633	.526	.415	.602

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Table 4

Heterotrait-Monotrait Scale

	<i>QRH</i>	<i>EAU</i>	<i>SPU</i>	<i>SAP</i>
<i>QRH</i>	.505			
<i>EAU</i>	.172	.786		
<i>SPA</i>	.205	-.091	.719	
<i>SAP</i>	.038	.143	.059	.586

Model Evaluation & Hypotheses Testing:

First, we analyzed the predictive value of our research model through coefficients of determination R^2 . As visible in Table 5, all the values range from .805 to .938, indicating a strong predictive power of our conceptual model. Besides, we also conducted Structure Equation Modelling to estimate the proposed relationships between study variables (Pavlov et al., 2021). To conduct the path analysis, we gathered all the t-values, f-values, and p-values (Bevan, 2013) and noted them down all in Table 6. As visible that, based on the statistical analysis, all the hypotheses are significantly supported by our empirical data. Thus, there is a strong significant relationship between Quantitative Research, perceived Ease of Use ($\beta= 0.357, P< .004$), and Perceived Usefulness ($\beta= 0.354, p< .000$). Likewise, the relationship between Perceived Ease of Use and Perceived Usefulness is also ($\beta= 0.176, P<.024$). Notably, the relationship between SPSS Acceptance, Perceived Ease of Use ($\beta= 0.130, P<.015$), and Perceived Usefulness is also accepted ($\beta= 0.111, P<0.016$).

Table 5

Coefficients of Determination R^2

S/R.	<i>Variable</i>	R^2	<i>Strength.</i>
1.	EAU	.872	Strong
2.	SPA	.805	Strong
3.	SAP	.938	Strong

Table 6

Hypotheses Assessment: Path Analysis & Linear Regression

Hyp.	<i>Relation</i>	<i>Path</i>	<i>t-</i>	<i>f</i>	<i>Sign</i>
H1a	QRH>EAU	.538	2.93	8.630	.004
H1b	QRH>SPU	.556	3.52	12.455	.000
H2	EAU>SPU	.642	1.54	4.375	.024
H3	EAU>SAP	.312	2.43	5.947	.015
H4	SPU>SAP	.567	2.00	2.117	.016

Discussion

According to Alsharhan et al., (2021), using technology to sustain the educational process has become a top priority in many countries. Brisk-paced innovation technology is changing academic arenas as we live in a knowledge-based society. Education as the fundamental human right demands different tactics to ensure the easy

flow of education, and research is an integral part of completing the educational journey. Sometimes students find quantitative data daunting, especially when they initiate their research exposure during academic thesis work. Moreover, when sample size and data are in bulk, a young researcher cannot manage them and require computer machines and software to manage and calculate the gathered data (Bryman & Cramer, 2004). However, today statistical tools are widely available for institutional and personal usage to complete the research process and solve complex research problems. Both instructors and young learners adapt these statistical tools to deal with the statistical issues relating to data management, coding, and manipulation to gather generalizable and valid results (Ali et al., 2021).

Current research also affirmed the importance of computer-based tools, especially Statistical Package for Social Sciences (SPSS), for quantitative research analyses. These results are highly consistent with the study conducted by Brezavšček et al., (2014), as the Slovenian students also considered computer-based technology as a source of facilitating their everyday research projects. As noted, the development of SPSS is much helpful and supportive for the students. More specifically, the relationship between quantitative research and perceived ease of use ($p < .004$) is consistent with the study conducted by Masood & Lodhi, (2016) as the researchers also found Statistical Package for Social Sciences (SPSS) usage as directly associated with the perceived ease of use. As noted that, compared to other statistical softwares, SPSS provides simple data entry options where data is coded into numbers and provide different analyses to magnify the result further.

Consequently, students widely use SPSS for quantitative research, indicating their interest in software as one of the most preferred software today. Moreover, the relationship between quantitative analysis and SPSS usefulness was found as significant ($p < .004$) and highly compatible with the arguments given by (Hecht & Ligas, 2016). As argued, SPSS provides the young researchers with accessibility and accessible operating services that further help them conduct the relevant analyses and calculate the data accordingly. With these helpful and supportive features, SPSS is considered a strongly preferred statistical software. These argumentations made by both Hecht & Ligas, (2016) and Masood & Lodhi, (2016) also supported the proposed relationship between ease of use and SPSS usefulness ($p < .025$) as they extensively attributed both factors dominating the motivation behind SPSS adoption today. Finally, we found an ease of use and SPSS usefulness ($p < .015$ & $p < .016$ respectively) as significantly liked with SPSS acceptance for the Social Sciences research purposes. The study conducted by Gogoi, (2020) also validated these results as stated that the applied math package, mainly known as Statistical Package for Social Sciences (SPSS), can help to perform all-purpose quantitative analyses. As IBM consistently adds more updates, now SPSS has even more options to perform robust analyses that work as one of the motivating mechanisms behind SPSS acceptance among researchers.

Hence, to understand quantitative research, it is essential to learn about the techniques, tactics, and software required to conduct the analysis. Today, researchers conduct different research studies to explore the new phenomenon and add novelty to the existing ones (Apuke, 2017). For this purpose, Statistical Package for Social Science

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(SPSS) facilitates the students to arrange, code, manipulate and attain the results in the best possible manner (Šebjan, 2014). It is also notable that, Statistical Package for Social Sciences was first developed in 1960 and faced several modifications over time. Social science researchers consider Statistical Package for Social Sciences one of the most user-friendly packages due to ease of usage and benefits attributed to this software. It offers high-quality graphics and tabulation facilities that even students can learn independently (Siddhisena, 2018). Watson (2015) further argued that besides the simple Analysis of Variance, Regression, Correlation, frequency calculation, measures of central tendency and others, the Social Package for Social Sciences also extends the existing tests. Such as "Multilevel Modelling" is an extension of simple regression analysis, providing a more in-depth analysis of cause and effect relationships.

Nonetheless, the efforts of IBM do not end here, as developing a more comprehensive yet simple program IBM AMOS is an extension of SPSS that provides even more complex statistical tasks with simple techniques (Connell, 1987). Similarly, Pakistan is a country where research in different disciplines is the need of the day. Academic researchers, independent researchers, professors, marketing researchers, doctors, microbiologists, and others conduct several projects to find generalizable results every day. Besides, these researchers and experts also focused on adding more knowledge to existing phenomena and proposed the new one that may benefit every part of society (Ansari et al., 2016). Likewise, suppose the research projects are macro-level, involving a considerable quantity of primary or secondary data. In that case, researchers may not arrange and analyze the gathered content without using the SPSS (Šebjan, 2014). The current article also examined the perceptions of academic, junior-level researchers about SPSS as a "task-management" tool. Therefore, we found that, when technology has facilitated all the fields of life, research and development is another major field that is availing enormous advantages from the technology acceptance, integration, and execution. As a result, complex tasks are now easy to perform, leading to less time, effort, with the accuracy of the results (Bibi, 2021; Kpolovie, 2017).

Summary and Conclusion

This research examined the Statistical Package for Social Sciences mainly due to the factors predicted by the Technology Acceptance Model. We proposed a study model under the essential variables highlighted by the Technology Acceptance Model to indicate the relevance of Statistical Package for Social Sciences with the computer-based innovation directly associated with perceived ease of use and usefulness. Results showed that perceived ease of use and usefulness are strong determinants of SPSS adoption among Pakistani students. Thus, keeping in view the current findings, we conclude that SPSS is one of the most useful and user-friendly research software for Pakistani students. Hence we assume that today when technology has facilitated all the fields of life, research and development is another major field that offers enormous advantages from the technology acceptance, integration, and execution.

Limitations and Contributions:

Even though this study contains novelty that we have observed in terms of the Technology Acceptance Model regarding SPSS usage, that is underrepresented, especially in Pakistan. There are some significant limitations as well. First, we only

focused on social sciences. However, other disciplines equally use and get benefitted from the SPSS usage. Second, we gathered data only from the social sciences' students that further add to the limitations of current research. Third, we collected data from public sector universities, yet private sector institutions and their students equally emphasize research as a part of their degree requirement. Still, this research contributes to the existing literature concerning technology acceptance and Statistical Package for Social Sciences. We also recommend more studies, mainly the reasons behind other research software programs, that can further highlight their significance in academia.

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