Journal of Scientometric Research, 2023; 12(3):558-569.
https://www.jscires.org

Research Article

Comprehensive Scientometric Analysis and Longitudinal SDG Mapping of Quality and Reliability Engineering International Journal

Chandan Kumar[1,*], Debidutta Pattnaik[2], Valentina Emilia Balas[3], Raghu Raman[4]

[1]Department of Computer Science and Engineering, Amrita School of Computing, Amrita Vishwa Vidyapeetham, Amaravati, Andhra Pradesh, INDIA.
[2]International Management Institute, Bhubaneswar, Odisha, INDIA.
[3]Faculty of Engineering, Aurel Vlaicu University of Arad, Arad, ROMANIA.
[4]Amrita School of Business, Amrita Vishwa Vidyapeetham, Amritapuri, Kerala, INDIA.

ABSTRACT

Quality and reliability are essential for future-proof products. Quality and Reliability Engineering International (QREI) has progressively evolved as one of the premier international outlets publishing on practical aspects of quality and reliability engineering. This is demonstrated by its publications, reaching 2978 articles (till search date) frequently cited in journals of international repute. QREI's citations in Scopus reached 39,399 on the search date, and its *h*-index is 67. Our research aims to compile a bibliometric overview of QREI research articles with a focus on a novel analysis from the perspective of sustainable development. Using Excel, R, VOSviewer, and Gephi software, we analyzed the QREI's bibliographic records in Scopus and presented an overview of its 37 years between 1985 and 2022. Among all the publications, "Multivariate statistical process control charts: An Overview" has received the highest citation (TC: 445). The United States dominates with 858 publications, while Beihang University features as its top-citing institution (TC: 370). Muhammad Riaz of "King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia" is the most prolific QREI author with 77 publications. Two hundred fifty-six articles are synchronous with the Sustainable Development Goals (SDGs). The top three SDGs are SDG9 (Industry, Innovation, and Infrastructure), SDG7 (Affordable and Clean Energy), and SDG3 (Good Health and Well-being). Further, the worldwide collaboration patterns and most prominent and influential topics of QREI have also been analyzed to discover the scholarly base of QREI publications. As far as we know, this is the first comprehensive and objective analysis of QREI applying scientometric methods including the SDG mappings.

Keywords: Bibliometric, Citation analysis, Sustainable Development Goals, Engineering, Science mapping.

Correspondence:
Chandan Kumar
Amrita School of Computing,
Amrita Vishwa Vidyapeetham,
Amaravati-522503, Andhra Pradesh,
INDIA.
Email: k_chandan@av.amrita.edu,
chandan.jha150286@gmail.com
ORCID ID: 0000-0003-1212-8418

Received: 12-03-2023;
Revised: 11-08-2023;
Accepted: 15-10-2023.

INTRODUCTION

Quality and reliability are fundamental to products engineered to function both now and in the near future. Quality demonstrates how well an item serves its intended function, while reliability shows how effectively it maintains its initial quality level in varying conditions. The industry, driven by global competition, faces pressure to create novel products within shorter time frames and with higher levels of reliability and quality. However, achieving this goal necessitates the development of innovative approaches/methodologies in quality and reliability engineering. Throughout contemporary history, shifts have occurred in the concepts of quality models, approaches, and practices, progressing from mere inspection and quality control to the implementation of quality assurance, and further evolving into the realms of quality management and quality by design.[1] These quality movements were championed by renowned professionals such as Shewhart, Deming, Juran, Taguchi, and others, who laid the foundational principles for the quality approach adopted across various industry and business sectors. The founding editors of QREI strongly believed in the convergence of quality and reliability in engineering.[2] Emanating from such foundational vision, statistical methods related to quality and reliability engineering research frequently feature in QREI publications serving the requirements of academia and industry alike.

The journal has established its reputation as a favourite platform for the submission of original and high-quality research emphasizing the aspects of quality and reliability in the fields of

DOI: 10.5530/jscires.12.3.053

systems engineering, control engineering, electrical, mechanical, electronic and communications, software engineering, consumer products, railways, automotive, aerospace, shipboard equipment, and management. QREI is indexed in all reputed databases like Science Citation Index Expanded (SCIE) (Web of Science), Scopus (Elsevier), and SCImago, among others. The Journal Citation Report (JCR) 2021's impact factor of *QREI* is 3.007. It means that articles published in *QREI* between 2019 and 2020 were cited at least 3.007 times in journals indexed in Web of Science. As per Scopus, *QREI's* CiteScore of 4.2 in 2021 indicates that its research received, on average, 4.2 Scopus citations during 2018-2021. Furthermore, the Source Normalized Impact Factor (SNIP) for the journal is 1.511. It means that the citation rate for all *QREI* papers is at least 1.511 times the citation rate for all journals indexed in the same knowledge domain in Scopus. SCImago's Journal Rank (SJR) gives *QREI* an *h*-index of 67. It means that at least 67 different articles from *QREI* were cited at least 67 times in Scopus on the search date. Such metrics of the journal affirm its global reputation among peers and the broader scientific fraternity. Scopus ranks *QREI* as 49 among 171 journals indexed in the category of Safety, Risk, Reliability, and Quality and Google Scholar identifies *QREI* as 12 among its 20 prominent outlets publishing on quality and reliability in 2021. Examining an individual journal using bibliometric methods provides a holistic view of the publication, presenting an analysis that goes beyond mere surface-level scrutiny. This approach can unveil the journal's quality, developmental stage, and overall productivity.[3] In this study, we develop a bibliometric profile of QREI, examining its publications, citations, and thematic evolution between 1985 and 2022. Bibliometrics—another name for scientometrics—is the statistical analysis of bibliographic data. It is highly recommended for establishing the historiography of academics, academic outlets, subject areas, institutions, or nations to design policies or evaluate performance.[4-7] Numerous endeavours are evident in the literature embracing bibliometric reviews of academic outlets such as "Journal of Accounting and Public Policy",[4] "Journal of Advertising",[6] "*Journal of Business Research*",[8] "Computers and Industrial Engineering",[9] "European Journal of Marketing",[10] "Applied soft computing",[11] "Information Sciences",[12] "Nueurocomputing",[13] "Fuzzy Optimization and Decision Making",[14] "Information Systems Journal",[15] "Remote Sensing",[16] "Soft Computing",[17] "Fuzzy Set Theory Journals",[18] "Journal of Network and Computer Applications",[19] "Applied Mathematical Modelling",[20] "European Management Journal",[21] "Fuzzy Sets and Systems",[22] "IEEE Access",[23] "Journal of Computer Assisted Learning",[24] "TQM Journal",[25] and many more. Unfortunately, it's a misnomer that none attempt to examine the evolution of QREI over the years. Franceschini and Maisano[26] conducted a bibliometric survey of quality engineering-management journals, focusing on 12 such journals, including *QREI*. Their study primarily utilized bibliometric indicators such as the *h*-index and the number of citations to compare the performance of these journals. However, their analysis was limited in scope. In contrast, our current paper delves deeper into the subject by conducting an extensive examination of the evolution of *QREI* specifically within the timeframe of 1985-2022.

We aim to close the gap with four major objectives. Our first goal is a thorough analysis of *QREI*'s publications, citations, and contributions. Examining the journal's publication and citation patterns clarifies its increasing productivity and influence. *QREI* authors' contributions and affiliations are examined to learn more about the specific institutions and authors contributing significantly to the journal's success. The precise research questions addressing this objective are:

RQ1: How are *QREI*'s publications and citations organized?

RQ2: Which articles are most influential in *QREI*, and who are its most leading contributors?

RQ3: Which journals, subject areas, and authors' affiliations frequently cite *QREI* articles?

Our second objective is to introspect the collaboration patterns within *QREI*. Collaborations between authors from various institutional contexts are more common than those between authors from the same country or institution. The research questions emanating from this objective are:

RQ4: To what extent do the authors of *QREI* collaborate?

RQ5: How diverse are the worldwide collaborations of *QREI* authors?

Our third objective is to trace the evolution of *QREI* themes. Such analysis adds immense value to researchers looking for possible themes/avenues to begin or continue their academic discourse. By knowing the dominating themes, the editorial board may track the future trajectory of the journal more effectively. The research question aligned with our specific objective is:

RQ6: What themes are most prominent and influential in *QREI*?

Our fourth and final objective is to identify how *QREI* research relates to the SDGs set by the United Nations.

RQ7: How many articles of *QREI* are connected to SDGs?

Following is the paper's outline: The data collection and analysis procedures are discussed in Section 2. Performance analysis (bibliometric results) of *QREI* publications is shown in Section 3, while *QREI*'s pattern of collaboration is presented in Section 4. Section 5 describes the graphical overview of influential *QREI* themes, prominent topics, and publication connections with SDGs, while in Section 6, we summarize our significant findings and conclude the paper with the study limitations.

DATA SOURCE AND METHODOLOGY

Scopus was used to collect the data for this study as it provides a wide range of scientific publications that meet strict indexing criteria. For bibliometric studies, it is one of the most important scientific databases that is frequently used.[6] Specifically, we used the "*SPAR-4-SLR (Scientific Procedures and Rationales for Systematic Literature Reviews)*" method developed by Paul *et al.*[27] and used extensively by Raman *et al.*[28,29] Figure 1 highlights the stage-wise fulfilment of the "*SPAR-4-SLR*" protocol.

Assembling

The initial step, known as assembling, involves gathering of publications for examination. We used the query "*Quality and Reliability Engineering International*" in source titles of Scopus to gather 3400 *QREI* publications between 1985 and July 2022.

Arranging

The second step involves the arrangement of bibliographic records using specific inclusions and exclusions criteria. The information was catalogued using publication details such as title, author, keywords, and country of origin, number of citations, and number of works cited. Further, a total of 422 publications—comprising of conference papers, retracted papers, editorials, letters, erratum, notes, conference reviews, and erroneous records—were excluded as part of our purification process.[30-32] The conference papers are excluded due to their commonly lower scientific impact and lower robustness.[30] It is noteworthy that impactful conference papers often evolve into journal articles, as highlighted by influential bibliometric and scientometric studies like Donthu *et al.*,[31] Pattnaik *et al.*[32] These considerations have led us to make a special focus on excluding conference papers, notes, editorials, etc. as done in previous bibliometric works.

Figure 1: SPAR-4-SLR protocol.

Assessing

Evaluation and reporting are part of the last stage assessment. The article's evaluation section highlights the analysis approach and research constraints. MS Excel, R-Studio, VOSviewer, and Gephi are the main tools used to evaluate data and analyze trends. Ethics approval was not required as our review is mainly based on secondary data from Scopus.

PERFORMANCE ANALYSIS

A journal's publications, citations, and impact are assessed and reported through performance analysis.[5-7] This analysis resembles the normal participant profile found in empirical research but with more depth and evaluation. Several metrics related to publications, citations, and collaborations are included in the performance analysis.

Publication and citation structure of QREI

Our first Research Question (RQ1) examines *QREI*'s publication and citation structure. Scopus database, Excel and R-Studio are mainly used to find publication and citation structure. QREI started publishing with four issues per year from 1985 to 1989. The number of issues reached five by 1990 and six between 1991 and 2003. Since 2004, the journal has published eight regular issues every year. Figure 2 shows the growth in the number of articles published annually and the history of publication. We analyzed QREI's publications and citations using various quantitative metrics such as Total Publications (TP), Number of Cited Publications (NCP), Total Citations (TC), Average Citations (TC/TP), Citations per Cited Publication (C/CP), *h*-index, *g*-index, *i*-10 index, *i*-100 index, *i*-200 index, number of active years (NAY), and Productivity per Active Year (PAY).

Scientific output is measured by the Total number of Publications (TP), while the scientific impact is measured by the Total number of Citations (TC). The average impact can be measured by looking at both the total number of citations to a paper and the average number of Citations to that Paper (C/CP). The *h*-index

and *g*-index are used to assess the significance and impact of a study.[33,34] We ranked the significance of the *QREI* study using the *i*-10, *i*-100, and *i*-200 indices. These indices include *QREI* articles that have been cited at least 10, 100, and 200 times, respectively. An author's activity and research output are reflected in their Number of Active Years (NAY) and Productivity per Active Year (PAY).[7] The summarized information is presented in Table 1. The Descriptive information about RQ1 is provided in Supplementary Data (Table S1).

Table S1 shows that the Total number of Publications (TP) for *QREI* has grown from 30 in 1985 to 214 in 2021, and 210 articles have been published till the search date in 2022 (i.e., 26/07/2022).

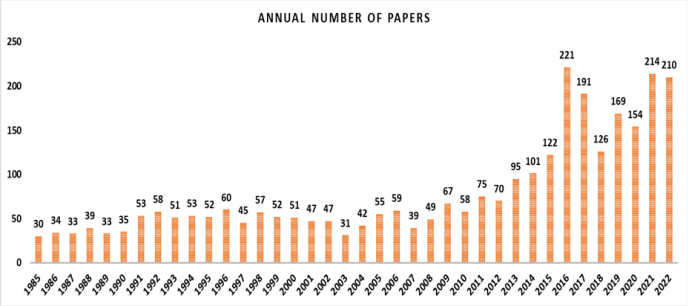

Figure 2: Annual publication in *QREI*.

To evaluate the influence of a journal and article in the scientific community, citations are a crucial indicator.[35] The *QREI* articles received 39,399 citations (Table 1) between 1985 and 2022, with 85.96% (2560) articles cited at least once.

The typical number of Citations per Cited Publication (C/CP) was 9 in 1985. By 2007, it rose to 47 (the highest level ever) (Table S1). The average citations per cited article for the last three years are below 10 as the articles are comparatively new. This figure is more likely to increase over the coming years. The *h*-index, which measures journal influence, reached 29 in 2016, while the *g*-index reached 40 (i.e., 1600 citations) in 2013 and 2016.

Bifurcation of *QREI*'s influential publications into low, medium, and highly significant research counts to 1168, 29, and 4, respectively (Table 1). About 39.22% (1168/2976) of the articles were cited at least 10 times (*i*-10 index), 0.97% (29/2976) were cited at least 100 times (*i*-100 index), and 0.13% (4/2976) were cited at least 200 times (*i*-200 index). As expected, such figures indicate the growing influence and impact of the journal over the years. Conversely, the journal's productivity—which measures its yearly Publication per Active Year (PAY)—started with 30 articles in 1985 and reached 214 by 2021 (Table S1), suggesting exponential growth.

Table 1: Journal overview.

Panel A. Descriptive statistics	
Total Publications (TP)	2,978
Number of Cited Publications (NCP)	2,560
Total Citations (TC)	39,399
Average Citations (TC/TP)	13
h-index	71
g-index	108
i-10	1,168
i-100	29
i-250	4
Number of Active Years (NAY)	38
Productivity per Active Year (PAY)	78
Panel B. Co-authorship information	
Number of Contributing Authors (NCA)	8,183
Number of Affiliated Authors (excludes repetitions) (NAA)	4,523
Authors of Single-Authored documents (ASA)	338
Authors of Co-Authored documents (ACA)	4,320
Single-Authored documents (SA)	507
Co-Authored documents (CA)	2,471
Collaboration Index (CI)	1.75
Collaboration Coefficient (CC)	0.64
Average authors per co-authored article	3

Note: This table summarizes the research published in *QREI* between 1985 and 2022.

Top articles, leading authors, and countries

The second research question investigates *QREI*'s top articles (cited at least 100 times), top authors (published at least 15 papers), and their affiliations. Scopus and Excel are mainly used in this investigation. Table S2 (Supplementary data) lists *QREI*'s top-cited publications. The most cited paper entitled "Multivariate statistical process control charts: An overview" published by Bersimis *et al.* (2007) has received the highest number of Scopus citations (445), averaging around 30 cites per year. This paper provides a comprehensive guide to the use of control charts for multivariate statistical process control. The most frequently cited *QREI* articles reveal a range of topics. Some of the most influential articles deal with a bootstrap control chart, fuzzy TOPSIS approach, change point method, Six Sigma, multi-response optimization, system reliability optimization, Taguchi method, Weibull proportional hazards model, artificial neural networks, Bayesian belief nets, Lean Six Sigma, and risk priority.

The most frequent and competent *QREI* authors between 1985 and 2022 are listed in Table S3 (Supplementary data). The table also contains details and metrics for citations of the most influential authors. Riaz M. is the most prolific contributor with 77 *QREI* articles, followed by Castagliola P. and Montgomery D.C. with 56 and 52 publications, respectively. The Total Citations metric (TC) suggests that Riaz M. has also been the most impactful, with 1672 citations, followed by Castagliola P. with 1364 citations, and Woodall W.H. cited 1293 times. Woodall W.H. also has the greatest average number of citations per publication, with 54. The details of the authors of the *QREI* papers show that the journal has succeeded in acquiring a considerable number of articles from high-ranking and globally recognized experts.

Next, we examined the authors' affiliated nations frequently contributing to *QREI*. Table S4 (Supplementary data) enlists the top countries. We observe that authors associated with institutions based out of the United States, China, the United Kingdom, Taiwan, and Pakistan dominate our list with 858, 427, 264, 208, and 152 publications, respectively.

QREI authors affiliated with the United States contributed 23% of all publications, while China, the United Kingdom, Taiwan, and Pakistan contributed 11%, 7%, 6%, and 4%, respectively. In addition, authors from the United States have the highest h-, g, i-10, and i-100 indices (50, 77, 354, and 10, respectively), suggesting the greatest academic influence and impact.[4,6,7] Surprisingly, only five nations, including the United States, Italy, the Netherlands, Greece, and Egypt, have provided at least 200 citations to *QREI* research (i-200). Among these five nations, authors affiliated with the United States have contributed 5 articles cited above 200 times each, while the same index for the remaining four countries is only for a single paper. Given the global diversity of the scientific fraternity in quality and reliability research, such a figure is likely to change in the near future.

Top journals, subject areas, and authors' affiliations citing QREI

Our 3rd research question examines the leading journals, subject areas, and author affiliations that frequently cite *QREI*. Scopus and Excel are mainly used in this investigation. Table S5 (Supplementary data) reveals the top 20 journals and subject areas that cite *QREI* frequently. Apart from *QREI* citing itself, we find that articles published in "*Reliability Engineering and System Safety*", "*Computers and Industrial Engineering*", "*International Journal of Advanced Manufacturing Technology*", and "*International Journal of Production Research*" often cite *QREI* articles suggesting the outward flow of *QREI*'s academic influence to other peer-referred outlets of international repute.

Regarding the subject areas, as highlighted in Table S5, we find that the influence of *QREI* is inter-disciplinary dominated by frequent citations from *Engineering* (14,849 times), followed by "*Computer Science*", "*Decision Sciences*", "*Mathematics*", and "*Business, Management, and Accounting*" with 6380, 5229, 5049, and 3266 citations, respectively. Interestingly, leaving aside subjects such as "*Health Professions*", "*Pharmacology, Toxicology*", and "*Pharmaceutics*", *QREI* has successfully gathered more than 100 Scopus citations from other disciplines as well.

Table S6 (Supplementary data) shows the top authors' affiliations frequently citing *QREI* papers. Beihang University tops our list with 370 citations, followed by "*Universiti Sains Malaysia*", "*King Fahd University of Petroleum and Minerals*", "*City University of Hong Kong*", and "*King Abdulaziz University*" citing at least 176 *QREI* articles each. Among the authors' affiliated nations, China is at the top of our list, followed by the United States, India, Iran, and Italy, citing 3631, 1524, 820, 802, and 571 times, respectively. Further, Figure 3 reveals the nations citing at least 100 *QREI* articles on the search date.

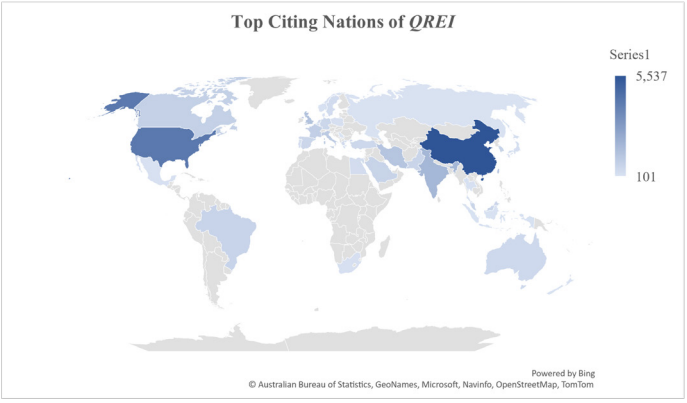

Figure 3: Top citing nations of *QREI*.

Note: This figure shows the nations citing at least 100 *QREI* documents on the search date.

COLLABORATION PATTERNS

Our second goal is to study the patterns of collaboration within *QREI*. Scops and Excel are used in finding the patterns of collaboration. To understand the evolving collaborations amongst *QREI* authors, a co-authorship analysis is useful.[4] NCA (Number of Contributing Authors) refers to contributions and collaboration.[36] Donthu *et al.*,[6] and Pattnaik *et al.*,[7] advise using the CI (Collaboration Index), CC (Collaboration Coefficient), SA (number of Sole-Authored), and CA (number of Co-Authored) articles are some other measures of academic collaborations. The collaborative index is one of the first indicators of collaboration level. It represents the average number of authors. Collaborative Coefficient (CC) is a metric of research collaboration that considers both the average number of authors per manuscript and the percentage of multi-authored papers.

Our 4th research question is to understand the degrees of authorial collaboration. In addition to CI, CC, SA, and CS, Average Authors per Co-Authored Article (AACA) (mathematically calculated by (NCA-SA)/CA) can also be used to measure the degree of collaboration.[4,6,7] To ascertain the proportions of publications with single and multiple authors, and to analyze any prevailing inclination towards collaborative research involving multiple authors, the publication records of *QREI* have been examined and presented in Table S7 (Supplementary data). The authorship pattern over the course of the *QREI* is depicted in Figure 4.

Our study reveals that only 74 articles were single-authored during 2003-2012, which increased to 139 between 2013 and 2022. However, this figure is low during 1985-1992 and 1993-2002. It is also inferred that since 2003 the bulk of *QREI* publications has been by two to four authors suggesting frequent collaborations, which may indicate diversity in intellectual discourse. Further, as Table S7 (Supplementary data) appears, the percentage of sole-authored articles decreased from 48% during 1985-1992 to 9% between 2013 and 2022, while the percentage of co-authored articles increased from 52% during 1985-1992 to 91% between 2013 and 2022. The table also shows an increase in CI from 0.81 (1985-1992) to 2.04 (2013-2022), CC from 0.42 (1985-1992) to 0.67 (2013-2022), and AACA from 2.55 (1995-1992) to 3.23 (2013-2022). Thus, our empirical evidence supports the claims of Raman *et al.*[23] and Baker *et al.*[4] that increased specialization and methodological complexity are contribute to an increase in authorial collaborations across scientific domains.

Our 5th research question investigates the range of global collaborations among *QREI* authors. Based on the contributing authors' countries of origin, Table S8 (Supplementary data) depicts the ranking of the top co-authored papers at *QREI*. It shows that authors from Pakistan and Saudi Arabia work together most frequently, followed by those from the United States and Iran, Taiwan, Korea, and India. Overall, authors associated with the United States and China employ most commonly, indicating that these nations are the collaborating hearts of *QREI* publications.

The impact of international collaboration in terms of citations shows that close to 30% of publications have international collaborations, with a high citation impact of 15.9 citations per publication (Table 2).

THEMATIC ANALYSIS

Our 6th research question explores the important research themes of *QREI* and maps their progression. This research relies on information gathered from the titles and abstracts of 2,978 papers published in *QREI*. We didn't include generic stop words like "a", "the", "is", and "are" or more specific ones like "article", "paper", "research", and "study". A co-occurrence study of keywords[37] is used to investigate the convergence of subjects into themes in *QREI*, where "keywords" refer to the "bigram and trigram terms or topics" revealed by a machine learning n-gram analysis.[38] Börner

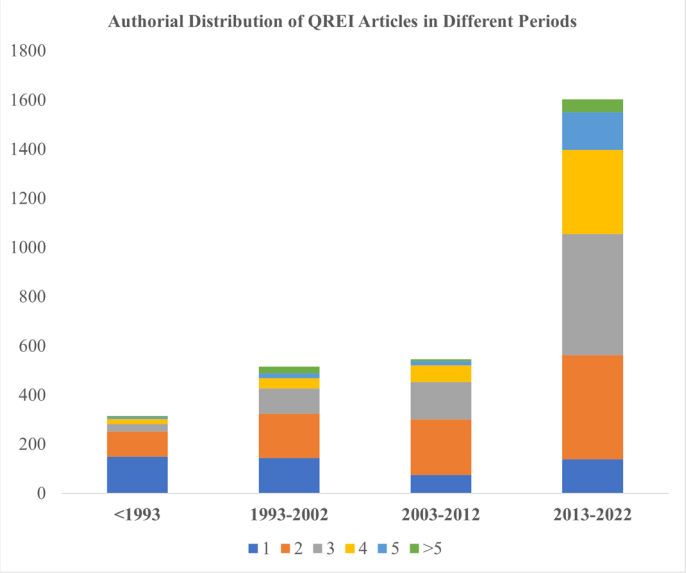

Figure 4: Authorial distribution of *QREI* articles in different periods between 1985 and 2022.

Note: This figure shows the distribution of *QREI* articles contributed by 1, 2, 3, 4, 5, and more than 5 *QREI* authors between 1985 and 2022. On account of the available data for 38 years of *QREI*'s academic journey, the first period depicts 8 years while the remaining reflects 10 years, each.

Table 2: International and national collaboration impact in *QREI*.

International Collaboration (%)	International Collaboration Impact	National Collaboration (%)	National Collaboration Impact	Institutional Collaboration (%)	Institutional Collaboration Impact
29.3%	15.9	26	13.9	29	13.2

et al.[39] and Andersen[40] suggest that frequent overlaps between keywords (topics) show thematic convergence, which makes it possible to think about subject areas or functional departments in a research field. We have compiled a variety of bibliometric data using the tools MS-Excel, R, VOSviewer, and Gephi to illuminate the depth of research in *QREI* and the underlying diversity of topics. Andersen[40] has noted that the number of citations of a scientific paper shows how important that paper is. Therefore, we used VOSviewer and Gephi to calculate how often the corresponding *QREI* article on each topic (keyword—bigram or trigram term) was cited on average.[41,42] The Average Publication Year (APY) was also composed as they correspond to the "hotness" (most recent) or "coldness" (least recent) of themes.[43] Overall, the analysis revealed 296 topics under 10 different clusters. In a co-occurrence analysis, the bigram and trigram words were used to show how the same ideas recur and form thematic clusters.[7] The first cluster is the largest, with 112 topics, followed by cluster 2, with 67 topics, cluster 3 with 29 topics, cluster 4 with 24 topics, cluster 6 with 15 topics, cluster 7 with 15 topics, cluster 5 with 13 topics, cluster 8 with 11 topics, cluster 9 with 5 topics, and cluster 10 with 5 topics.

Cluster 1: Reliability and risk analysis

The first cluster is the largest among all, with 112 topics related to reliability and risk analysis. Prominent themes discussed in the cluster are reliability analysis, system reliability, software reliability, reliability model, reliability prediction, reliability assessment, reliability evaluation, product reliability, system failure, reliability growth model, reliability improvement, risk factors, risk analysis, risk assessment, Weibull distribution, Bayesian network, Bayesian inference, competing risks, accelerated degradation, Wiener process, Fault Tree Analysis, Hazard rate, repairable system, likelihood estimation, exponential distribution, accelerated life test, and failure rate among others. "Reliability analysis" leads the cluster with the highest occurrences in 152 *QREI* articles. Based on average citations, "reliability optimization" tops our list with 39 citations per paper. Based on APY, the most recent topic from the cluster is "progressive hybrid censoring", with an APY score of 2021.0. Huang and Askin[44] and Levitin and Lisnianski[45] feature as the top-cited articles on reliability analysis and reliability optimization in our list, cited 118 and 183 times, respectively; and we find Alam *et al.*[46] as the most recent article on progressive hybrid censoring.

Cluster 2: Quality modelling

The second cluster contains 67 topics related to quality modelling. Prominent themes discussed in the cluster are quality characteristics, quality control, quality assurance, quality management, quality loss, multiple quality characteristics, total quality management, off-line quality control, process capability, manufacturing process, process performance, process yield, process improvement, and process variance. Some of the prominent research methods highlighted in the cluster include such terms as genetic algorithm, neural network, support vector machine, linear models, logistic regression, and Taguchi method, among others. "Quality control" leads the cluster with the highest occurrences in 113 *QREI* articles. Based on average citations, "Taguchi method" tops our list with 28 citations per paper. Based on APY, the most recent methodological topic from the cluster is "support vector regression", with an APY score of 2017.8. Williams *et al.*[47] and Tong and Su[48] feature as the top-cited articles on quality control and Taguchi method in our list, cited 230 and 175 times, respectively, while Gu *et al.*[49] article is the most recent that applies support vector regression.

Cluster 3: Process control modelling

The third cluster contains 29 topics related to process control modelling. Prominent themes discussed in the cluster are process control, statistical process, linear profiles, nonlinear profile, likelihood ratio, generalized likelihood, regression model, linear regression, profile monitoring, statistical monitoring, simultaneous monitoring, Gaussian process, and profile data, among others. "Process control" leads the cluster with the highest occurrences in 231 *QREI* articles. Based on average citations, "profile data" tops our list with 37 citations per paper. Based on APY, the most recent topic from the cluster is "simultaneous monitoring", with an APY score of 2018.5. Bersimis *et al.*[50] and Mahmoud *et al.*[51] feature as the top-cited articles on process control and profile data in our list, cited 445 and 250 times, respectively, while Rahimi *et al.*[52] article is the most recent on simultaneous monitoring.

Cluster 4: Process monitoring

The fourth cluster contains 20 topics related to process monitoring. Prominent themes discussed in the cluster are process monitoring, weighted moving average, Exponentially Weighted Moving Average (EWMA) control chart, process dispersion, efficient monitoring, synthetic control chart, and triple exponentially weighted moving average. "Weighted moving average" leads the cluster with the highest occurrences in 291 *QREI* articles. Based on average citations, the "synthetic control chart" tops our list with 24 citations per paper. Based on APY, the most recent topic from the cluster is "triple exponentially weighted moving average", with an APY score of 2021.3. Abbas *et al.*[53] and Machado *et al.*[54] feature as the top-cited articles on weighted moving average and synthetic control chart in our list cited 138 and 43 times, respectively, while Malela-Majika *et al.*[55] article is the most recent on triple exponentially weighted moving average control chart in our list.

Cluster 5: Control chart(s) based monitoring

The fifth cluster contains 12 topics related to control chart(s). Prominent themes discussed in this cluster are control chart(s), statistical control, auto correlated processes, monitoring time,

Poisson processes, and negative binomial. "Control chart(s)" leads the cluster with the highest occurrences in 778 *QREI* articles. Based on average citations, "Statistical control" tops our list with 20 citations per paper. Based on APY, the most recent topic from the cluster is "Monitoring time", with an APY score of 2019.7. Bersimis *et al.*[50] and Abbas *et al.*[53] feature as the top-cited articles on a control chart(s) and statistical control in our list, cited 445 and 138 times, respectively, while Zhang *et al.*[56] article is the most recent on monitoring time between events in our list. This article refines the lower side of the EWMA control chart by using the strength of Time Between adverse Event (TBE) observations to determine the trend of the decrease in the mean TBE value.

Pattnaik *et al.*[7] highlighted that an article may be associated with multiple topics. Here, the articles of Bersimis *et al.*[50] and Abbas *et al.*[53] are also associated with multiple topics. We can see that article of Bersimis *et al.*[50] was a part of cluster 3 and is also a part of cluster 5. In the same way, the article of Abbas *et al.*,[53] which was a part of cluster 4, also features in cluster 5.

Cluster 6: CUSUM (cumulative sum control chart)

The sixth cluster contains 14 topics related to CUSUM. Prominent themes discussed in the cluster are CUSUM, multivariate EWMA, multivariate CUSUM, Shewhart control, and adaptive multivariate EWMA, among others. "CUSUM" leads the cluster with the highest occurrences in 200 *QREI* articles. Based on average citations, "multivariate EWMA" tops our list with 12 citations per paper. Based on APY, the most recent topic from the cluster is "adaptive multivariate EWMA", with an APY score of 2020.2. Zhang *et al.*[57] and Testik *et al.*[58] feature as the top-cited articles on CUSUM and multivariate EWMA with 91 and 48 citations, respectively, while Haq and Khoo[59] article is the most recent on adaptive multivariate EWMA.

Cluster 7: Measurement error and process quality

The seventh cluster contains 15 topics related to measurement error and process quality. Prominent themes discussed in the cluster are measurement error, process quality, Markov chain, run length, average run length, compositional data, and multivariate coefficient. "Measurement error" leads to the cluster with the highest occurrences in 64 *QREI* articles. Based on average citations, "process quality" tops our list with 29 citations per paper. Based on APY, the most recent topic from the cluster is "compositional data", with an APY score of 2019.6. Hu *et al.*[60] and Williams *et al.*[47] feature as the top-cited articles on measurement error and process quality in our list, cited 49 and 230 times, respectively, while Imran *et al.*[61] (2022) article is the most recent on compositional data.

Cluster 8: Sample size, shape, and scheme in quality and reliability research

The eighth cluster contains 10 topics related to sample size, shape, and scheme in quality and reliability research. Prominent themes discussed in the cluster are sample size, shape parameter, sampling scheme, Weibull shape, and Double Sampling (DS). "Sample size" leads to the cluster with the highest occurrences in 189 *QREI* articles. Based on average citations, "double sampling" tops our list with 19 citations per paper. Based on APY, the most recent topic from the cluster is the "sampling scheme", with an APY score of 2016.0. Zhang *et al.*[57] and He and Grigoryan[62] feature as the top-cited articles on sample size and double sampling in our list, cited 91 and 58 times, respectively, while Hyder *et al.*[63] article is the most recent on the sampling scheme.

Cluster 9: Adaptive EWMA

The ninth cluster contains 5 topics related to adaptive EWMA. Prominent themes discussed in the cluster are adaptive EWMA, Monte Carlo, and Real data sets. "Real data sets" leads the cluster with the highest occurrences in 26 *QREI* articles. Based on average citations, "adaptive EWMA" tops our list with 20 citations per paper. Based on APY, the most recent topic from the cluster is "adaptive EWMA", with an APY score of 2019.1. Riaz *et al.*[64] and Aly *et al.*[65] feature as the top-cited articles on real data sets and adaptive EWMA in our list, with 52 and 63 citations, respectively, while Sarwar *et al.*[66] article is the most recent on the adaptive EWMA.

Cluster 10: Anomaly detection

The tenth cluster contains 5 topics related to anomaly detection. Prominent themes discussed in the cluster are anomaly detection, intrusion detection, and social networks. "Anomaly detection" leads to the cluster with the highest occurrences in 9 *QREI* articles. Based on average citations, "intrusion detection" tops our list with 38 citations per paper. Based on APY, the most recent topic from the cluster is "social networks", with an APY score of 2019.0. Ye and Chen[67] feature as the top-cited articles on anomaly and intrusion detection in our list cited 172. Hazrati-Marangaloo and Noorossana[68] article is the most recent on social networks.

Temporal analysis of *QREI* themes

This section presents the temporal evolution of *QREI* themes during five APY periods.

- APY 1985.0 and 2000.0: Figure S1 (Supplementary data) demonstrates the dominant topics in *QREI* between APY 1985.0 and 2000.0. Highly impactful terms include hazard rate curve, hazard modelling, reliability prediction, total quality management, and Taguchi method.
- APY 2000.1 and 2005.0: Figure S2 (Supplementary data) shows the themes that became popular in *QREI* between APY 2000.1 and 2005.0. Highly impactful terms include

offline quality control, quality engineering, product design, proportional hazards, reliability improvement, and quality improvement.

- APY 2005.1 and 2010.0: Figure S3 (Supplementary data) suggests the themes that gained prominence in *QREI* between APY 2005.1 and 2010.0. Highly impactful terms include reliability optimization, fault tree, failure mode, process quality, manufacturing quality, quality control, statistical control, and intrusion detection.
- APY 2010.1 and 2015.0: Figure S4 (Supplementary data) reveals the themes that gained prominence in *QREI* with APY between 2010.1 and 2015.0. Highly impactful terms include reliability estimation, maintenance management, multiresponse optimization, multiple quality characteristics, simple linear regression, statistical monitoring, control chart, cumulative sum control, sample size, double sampling, Weibull shape, process parameters, and synthetic control.
- APY 2015.1 and 2022.0: Figure S5 (Supplementary data) reveals the popular and influential themes on *QREI* with APY between 2015.1 and 2022.0 such as multivariate CUSUM, multivariate EWMA, adaptive EWMA, EWMA control, risk factors, profile data, anomaly detection, and condition-based maintenance. In order to propose future studies or contributions to the journal, researchers could examine the current topics and consider those that arise from the gaps indicated by the missing links in the journal's thematic maps.

Prominent research areas

We have also focused on the prominence percentile to evaluate the level of interest in or exposure to this study. The citation counts, views, and average CiteScore are the three indications that Scival uses to determine a topic's momentum. We have uploaded the entire data of *QREI* in Scival to get prominent research topics. Eight study topics listed in Table 3 are ranked by prominence percentile. These study topics have high percentiles of visibility, ranging from 99.71 to 97.21. The top three topics with high prominence percentile are i) Useful Life; Health Care Management; Rolling Bearing (99.71), ii) Total Quality Management; Process Monitoring; Six Sigma (99.02), and iii) Fidelity; Surrogate Model; Metamodelling (98.67).

MAPPING to SDGs

Our last and final research question is about mapping the articles of *QREI* with SDGs. Scopus and SciVal are mainly used in mapping the articles with SDGs. The SDGs, also known as the Global Goals, was established by the United Nations in 2015. These goals have 17 objectives that must be achieved by 2030, and its progress is measured by 169 indicators. There have been several research studies published that relate how publications map to various SDGs.[28,29,69] Here, Elsevier SDG Mapping Initiative[70] has been used for mapping the *QREI* papers with SDG.

Our choice of the Elsevier SDG Mapping Initiative is based on its direct integration within the search criteria of the Scopus database through its Science-Metrix group. The initiative employs 17 distinct SDG queries to map publications to the corresponding 17 SDGs. These queries have been meticulously devised based on the unique targets and sub-targets of each SDG. Further refinement for precision is achieved through thorough review and feedback from experts and academics. These queries were then supplemented by a machine learning model, ensuring the precision remained above 80%. The Scopus database facilitates the research process by providing pre-set search queries for each SDG.[71]

According to Elsevier SDG Mapping, 256 articles in "*QREI*" map to various SDGs. Table 4 enlists the SDGs that have the most articles mapped. Industry, innovation, and infrastructure (SDG9), affordable and clean energy (SDG7), and good health and well-being (SDG3) have the most mapped publications in *QREI*.

The top three articles mapped to these SDGs are listed in Table S9 (Supplementary data). According to citations, SDG9 is the most mapped, with 2210 citations. The top-cited article on SDG9, by Gijo and Antony,[72] discusses how a project in an Indian hospital's

Table 3: Prominence percentile-ranked research topics.

Research topics	TP	PP
Useful life; health care management; rolling bearing.	24	99.71
Total quality management; process monitoring; six sigma.	9	99.02
Fidelity; surrogate model; metamodeling.	19	98.67
Structural reliability; Monte Carlo method; normal space.	12	98.66
Failure modes and effects analysis; risk ranking; risk assessment.	35	98.09
Preventive maintenance; geometric process; repairable system.	17	97.83
Wiener process; useful life; degradation.	63	97.68
Probability weighted moments; maximum likelihood method; Weibull distribution.	15	97.21

Note: This table shows the prominence percentile-ranked research topics in QREI. Here TP = total publications and PP = prominence percentile.

Table 4: SDG-related research in QREI.

SDG	TP	TC
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE	156	2210
7 AFFORDABLE AND CLEAN ENERGY	42	566
3 GOOD HEALTH AND WELL-BEING	34	292
11 SUSTAINABLE CITIES AND COMMUNITIES	8	59
6 CLEAN WATER AND SANITATION	5	22
13 CLIMATE ACTION	5	59
8 DECENT WORK AND ECONOMIC GROWTH	4	78
10 REDUCED INEQUALITIES	3	67
12 RESPONSIBLE CONSUMPTION AND PRODUCTION	3	29
15 LIFE ON LAND	3	82
4 QUALITY EDUCATION	2	22
16 PEACE, JUSTICE AND STRONG INSTITUTIONS	2	8
14 LIFE BELOW WATER	1	3

Note: This table shows the prominence percentile-ranked research topics in QREI. Here TP = total publications and PP = prominence percentile.

outpatient department was able to reduce patient wait times with a process-innovation and improved value-chain management. The top-cited article on SDG7, by Sari *et al.*,[73] proposes a reliability estimation model for LED lighting systems leading to energy efficiency and reduced energy consumption. Conversely, the top-cited article on SDG3 by Han *et al.*[74] discusses the use of control chart techniques in public health and public health surveillance to detect increases in the prevalence of diseases.

CONCLUSION

This article presents analytical results of publication and citation patterns, authorship structure, collaboration patterns, and thematic and temporal analysis of topics published in the *QREI* journal. This study delivers important conclusions and consequences for *QREI*'s readers and stakeholders using performance analysis, text mining (machine learning n-gram analysis), and science mapping (co-occurrence analysis).

Firstly, *QREI* has become a leading publication hub, regularly ranking among the best international journals in the field of quality and reliability engineering for a variety of well-known benchmark metrics (e.g., Scopus CiteScore, Scimago Journal Rank, Web of Science: SCI impact factor and Google Scholar). The journal has published almost seven times as much in recent years as it did initially. *QREI* editors and editorial board members are encouraged to curate editorials to convey the themes, novelty, and rigour they expect from prospective and experienced journal contributors. Interestingly, the journal's intelligentsia covers diversified topics from twenty different disciplines. However, engineering, computer science, and decision science discourse has dominated *QREI* discussions over the years.

Second, the importance of collaboration: There has been an increasing trend of multi-authored papers and the proportion of papers involving international collaboration. Initially (1985-1992), 52% of *QREI* publications were multi-authored, which is now increased to 91% (2013-2022). While single-authored articles are reduced to 9% (2013-2022) from 48% (1985-1992). The top three research collaborative countries are Pakistan-Saudi Arabia, United States-Iran, and United States-Taiwan.

Third, *QREI* has contributed to a wide range of topics. Our analysis reveals 296 topics under 10 different clusters, namely reliability and risk analysis, quality modelling, process control modelling, process monitoring, control chart(s) based monitoring, CUSUM (cumulative sum control chart), measurement error and process quality, sample size, shape, and scheme, adaptive EWMA, and anomaly detection. The most recent trending topics include triple exponentially weighted moving average (APY 2021.3), progressively hybrid censoring (APY 2021), adaptive multivariate EWMA (APY 2020.2), adaptive EWMA (2019.1), multivariate CUSUM (2018.6), Wiener process (2018.5), risk analysis (2017.8) and Bayesian network (2017.3).

Fourth, *QREI* contribution to SDG-related articles: Our analysis revealed 256 articles given the focus areas connected to the SDGs. The most contributed and cited articles are synchronized with SDG9 (on industry, innovation, and infrastructure).

Another encouraging indicator for this journal is its increase in interdisciplinary research papers with multiple authors.

Nevertheless, despite the contributions of this retrospective survey of *QREI*, there are several limitations. First, this study remains limited to the accuracy and completeness of the bibliometric data of the journal in Scopus. Best efforts have been undertaken to ensure that the data are clean and accurate (e.g., correcting erroneous entries and text mining using machine learning instead of manual coding). Second, the quality and reliability engineering review here is limited to the insights from *QREI* and remains limited to the journal's performance. Thus, future retrospectives may survey a wide range of quality and reliability engineering

journals and provide a more comprehensive overview of quality and reliability engineering outlets.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

ABBREVIATIONS

AACA: Average authors per co-authored article; **ACC:** Annual collaboration coefficient; **ACI:** Annual collaboration index; **APY:** Average publication year; **CA:** Number of co-authored; **CC:** Collaboration coefficient; **CI:** Collaboration index; **CUSUM:** Cumulative sum control chart; **CNAA:** Cumulative number of affiliated authors; **C/CP:** Citations per cited publication; **EWMA:** Exponentially weighted moving average; **GA:** Growth in authorship; **JCR:** Journal Citation Report; **NAY:** Number of active years; **NCA:** Number of contributing authors; **NCP:** Number of cited publications; **PAY:** Productivity per active year; **SA:** Number of sole-authored; **SCIE:** Science Citation Index Expanded; **SDGs:** Sustainable Development Goals; **SJR:** SCImago's Journal Rank; **SNIP:** Source Normalized Impact Factor; **SPAR-4-SLR:** Scientific Procedures and Rationales for Systematic Literature Reviews; **TBE:** Time between adverse event; **TC:** Total Citations; **TP:** Total Publications; **TC/TP:** Average citations; **QREI:** Quality and Reliability Engineering International.

REFERENCES

1. Zonnenshain A, Kenett RS. Quality 4.0-the challenging future of quality engineering. Quality Engineering. 2020;32(4):614-26.
2. Finn J, O'Connor Patrick DT, Kam WL. Editorial, *Quality and Reliability Engineering International*, 1985;1.1.
3. Kevin WU, Zainab AN, Anuar NB. Bibliometric studies on single journals: A review. Malaysian Journal of Library and Information Science. 2009;14(1):17-55.
4. Baker HK, Kumar S, Pattnaik D, Pandey N. The Journal of Accounting and Public Policy at 40: A bibliometric analysis. Journal of Accounting and Public Policy. 2022:107003.
5. Donthu N, Gremler DD, Kumar S, Pattnaik D. Mapping of Journal of Service Research themes: A 22-year review. Journal of Service Research. 2022;25(2):187-93.
6. Donthu N, Lim WM, Kumar S, Pattnaik D. The journal of advertising's production and dissemination of advertising knowledge: A 50th anniversary commemorative review. Journal of Advertising. 2022;51(2):153-87.
7. Pattnaik D, Kumar S, Burton B, Lim WM. Economic Modelling at thirty-five: A retrospective bibliometric survey. Economic Modelling. 2022;107:105712.
8. Merigó JM, Mas-Tur A, Roig-Tierno N, Ribeiro-Soriano D. A bibliometric overview of the Journal of Business Research between 1973 and 2014. Journal of Business Research. 2015;68(12):2645-53.
9. Cancino C, Merigó JM, Coronado F, Dessouky Y, Dessouky M. Forty years of Computers and Industrial Engineering: A bibliometric analysis. Computers and Industrial Engineering. 2017;113:614-29.
10. Martínez-López FJ, Merigó JM, Valenzuela-Fernández L, Nicolás C. Fifty years of the European Journal of Marketing: a bibliometric analysis. European Journal of Marketing. 2018; 52(1/2):439-68.
11. Muhuri PK, Shukla AK, Janmaijaya M, Basu A. Applied soft computing: A bibliometric analysis of the publications and citations during (2004–2016). Applied Soft Computing. 2018;69:381-92.
12. Merigó JM, Pedrycz W, Weber R, de la Sotta C. Fifty years of Information Sciences: A bibliometric overview. Information Sciences. 2018;432:245-68.
13. Janmaijaya M, Shukla AK, Abraham A, Muhuri PK. A scientometric study of neurocomputing publications (1992–2018): An aerial overview of intrinsic structure. Publications. 2018;6(3):32.
14. Yu D, Xu Z, Wang W. A bibliometric analysis of Fuzzy Optimization and Decision Making (2002–2017). Fuzzy Optimization and Decision Making. 2019;18:371-97.
15. La Paz A, Merigó JM, Powell P, Ramaprasad A, Syn T. Twenty-five years of the Information Systems Journal: A bibliometric and ontological overview. Information Systems Journal. 2020;30(3):431-57.
16. Zhang Y, Thenkabail PS, Wang P. A bibliometric profile of the remote sensing open access journal published by MDPI between 2009 and 2018. Remote Sensing. 2019;11(1):91.
17. Merigó JM, Cobo MJ, Laengle S, Rivas D, Herrera-Viedma E. Twenty years of Soft Computing: a bibliometric overview. Soft Computing. 2019;23:1477-97.
18. Alfaro-García VG, Merigó JM, Pedrycz W, Gómez Monge R. Citation analysis of fuzzy set theory journals: bibliometric insights about authors and research areas. International Journal of Fuzzy Systems. 2020;22:2414-48.
19. Zurita G, Shukla AK, Pino JA, Merigó JM, Lobos-Ossandón V, Muhuri PK. A bibliometric overview of the journal of network and computer applications between 1997 and 2019. Journal of Network and Computer Applications. 2020;165:102695.
20. Verma R, Lobos-Ossandón V, Merigó JM, Cancino C, Sienz J. Forty years of applied mathematical modelling: A bibliometric study. Applied Mathematical Modelling. 2021;89:1177-97.
21. Bhukya R, Paul J, Kastanakis M, Robinson S. Forty years of European Management Journal: A bibliometric overview. European Management Journal. 2022;40(1):10-28.
22. Laengle S, Lobos V, Merigó JM, Herrera-Viedma E, Cobo MJ, De Baets B. Forty years of fuzzy sets and systems: A bibliometric analysis. Fuzzy Sets and Systems. 2021;402:155-83.
23. Raman R, Singh P, Singh VK, Vinuesa R, Nedungadi P. Understanding the bibliometric patterns of publications in IEEE access. IEEE Access. 2022;10:35561-77.
24. Akturk AO. Thirty-five years of the Journal of Computer Assisted Learning: A bibliometric overview. Journal of Computer Assisted Learning. 2022;38(5):1220-53.
25. Singh N, Arora S. Recognizing the legacy of the TQM Journal: a bibliometric analysis of Scopus indexed publications (2008-2021). The TQM Journal. 2023;35(4):946-63.
26. Franceschini F, Maisano D. A survey of Quality Engineering–Management journals by bibliometric indicators. Quality and Reliability Engineering International. 2010;26(6):593-604.
27. Paul J, Lim WM, O'Cass A, Hao AW, Bresciani S. Scientific procedures and rationales for systematic literature reviews (SPAR-4-SLR). International Journal of Consumer Studies. 2021; 45(4):O1-6.
28. Raman R, Subramaniam N, Nair VK, Shivdas A, Achuthan K, Nedungadi P. Women entrepreneurship and sustainable development: Bibliometric analysis and emerging research trends. Sustainability. 2022;14(15):9160.
29. Raman R, Nair VK, Prakash V, Patwardhan A, Nedungadi P. Green-hydrogen research: What have we achieved, and where are we going? Bibliometrics analysis. Energy Reports. 2022;8:9242-60.
30. Lisée C, Larivière V, Archambault É. Conference proceedings as a source of scientific information: A bibliometric analysis. Journal of the American Society for Information Science and Technology. 2008;59(11):1776-84.
31. Donthu N, Kumar S, Pattnaik D, Pandey N. A bibliometric review of International Marketing Review (IMR): past, present, and future. International Marketing Review. 2021;38(5):840-78.
32. Pattnaik D, Hassan MK, Kumar S, Paul J. Trade credit research before and after the global financial crisis of 2008–A bibliometric overview. Research in International Business and Finance. 2020;54:101287.
33. Egghe L. Theory and practise of the g-index. Scientometrics. 2006;69(1):131-52.
34. Alonso S, Cabrerizo FJ, Herrera-Viedma E, Herrera F. h-Index: A review focused in its variants, computation and standardization for different scientific fields. Journal of informetrics. 2009;3(4):273-89.
35. Garousi V, Mäntylä MV. Citations, research topics and active countries in software engineering: A bibliometrics study. Computer Science Review. 2016;19:56-77.
36. de Mesnard L. Attributing credit to coauthors in academic publishing: The 1/n rule, parallelization, and team bonuses. European Journal of Operational Research. 2017;260(2):778-88.
37. Callon M, Courtial JP, Turner WA, Bauin S. From translations to problematic networks: An introduction to co-word analysis. Social science information. 1983;22(2):191-235.
38. Silge J, Robinson D. Text mining with R: A tidy approach. " O'Reilly Media, Inc."; 2017.
39. Börner K, Chen C, Boyack KW. Visualizing knowledge domains. Annual review of information science and technology. 2003;37(1):179-255.
40. Andersen N. Mapping the expatriate literature: A bibliometric review of the field from 1998 to 2017 and identification of current research fronts. The International Journal of Human Resource Management. 2021;32(22):4687-724.
41. Bastian M, Heymann S, Jacomy M. Gephi: an open-source software for exploring and manipulating networks. In Proceedings of the international AAAI conference on web and social media. 2009;3(1):361-2.
42. Waltman L, Van Eck NJ, Noyons EC. A unified approach to mapping and clustering of bibliometric networks. Journal of informetrics. 2010;4(4):629-35.
43. Byington EK, Felps W, Baruch Y. Mapping the Journal of Vocational Behavior: A 23-year review. Journal of Vocational Behavior. 2019;110:229-44.
44. Huang W, Askin RG. Reliability analysis of electronic devices with multiple competing failure modes involving performance aging degradation. Quality and Reliability Engineering International. 2003;19(3):241-54.
45. Levitin G, Lisnianski A. A new approach to solving problems of multi-state system reliability optimization. Quality and reliability engineering international. 2001;17(2):93-104.

46. Alam I, Ahmad HH, Ahmed A, Ali I. Inference on adaptive progressively hybrid censoring schemes under partially accelerated life test for OLiHL distribution. Quality and Reliability Engineering International. 2022.
47. Williams JD, Woodall WH, Birch JB. Statistical monitoring of nonlinear product and process quality profiles. Quality and Reliability Engineering International. 2007;23(8):925-41.
48. Tong LI, Su CT. Optimizing multi-response problems in the Taguchi method by fuzzy multiple attribute decision making. Quality and reliability engineering International. 1997;13(1):25-34.
49. Gu L, Zheng R, Zhou Y, Zhang Z, Zhao K. Remaining useful life prediction using composite health index and hybrid LSTM-SVR model. Quality and Reliability Engineering International. 2022;38(7):3559-78.
50. Bersimis S, Psarakis S, Panaretos J. Multivariate statistical process control charts: an overview. Quality and Reliability engineering international. 2007;23(5):517-43.
51. Mahmoud MA, Parker PA, Woodall WH, Hawkins DM. A change point method for linear profile data. Quality and Reliability Engineering International. 2007;23(2):247-68.
52. Rahimi SB, Amiri A, Khoo MB, Shadman A. Simultaneous monitoring of mean vector and covariance matrix of auto-correlated multivariate multiple linear profiles. Quality and Reliability Engineering International. 2022;38(7):3513-42.
53. Abbas N, Riaz M, Does RJ. Mixed exponentially weighted moving average–cumulative sum charts for process monitoring. Quality and Reliability Engineering International. 2013;29(3):345-56.
54. Machado MA, Costa AF, Rahim MA. The synthetic control chart based on two sample variances for monitoring the covariance matrix. Quality and Reliability Engineering International. 2009;25(5):595-606.
55. Malela-Majika JC, Chatterjee K, Koukouvinos C. A multivariate triple exponentially weighted moving average control chart. Quality and Reliability Engineering International. 2022;38(4):1558-89.
56. Zhang Y, Shang Y, Hu X, Li AD. An improved exponential EWMA chart for monitoring time between events. Quality and Reliability Engineering International. 2022;38(5):2748-68.
57. Zhang M, Megahed FM, Woodall WH. Exponential CUSUM charts with estimated control limits. Quality and Reliability Engineering International. 2014;30(2):275-86.
58. Testik MC, Runger GC, Borror CM. Robustness properties of multivariate EWMA control charts. Quality and Reliability Engineering International. 2003;19(1):31-8.
59. Haq A, Khoo MB. An adaptive multivariate EWMA mean chart with variable sample sizes and/or variable sampling intervals. Quality and Reliability Engineering International. 2022;38(7):3322-41.
60. Hu X, Castagliola P, Sun J, Khoo MB. The effect of measurement errors on the synthetic chart. Quality and Reliability Engineering International. 2015;31(8):1769-78.
61. Imran M, Sun J, Zaidi FS, Abbas Z, Nazir HZ. Multivariate cumulative sum control chart for compositional data with known and estimated process parameters. Quality and Reliability Engineering International. 2022;38(5):2691-714.
62. He D, Grigoryan A. Construction of double sampling s-control charts for agile manufacturing. Quality and reliability engineering international. 2002;18(4):343-55.
63. Hyder M, Mahmood T, Butt MM, Raza SM, Abbas N. On the location-based memory type control charts under modified successive sampling scheme. Quality and Reliability Engineering International. 2022;38(4):2200-17.
64. Riaz M, Mehmood R, Does RJ. On the performance of different control charting rules. Quality and Reliability Engineering International. 2011;27(8):1059-67.
65. Aly AA, Saleh NA, Mahmoud MA, Woodall WH. A reevaluation of the adaptive exponentially weighted moving average control chart when parameters are estimated. Quality and Reliability Engineering International. 2015;31(8):1611-22.
66. Sarwar MA, Noor-ul-Amin M. Design of a new adaptive EWMA control chart. Quality and Reliability Engineering International. 2022;38(7):3422-36.
67. Ye N, Chen Q. An anomaly detection technique based on a chi-square statistic for detecting intrusions into information systems. Quality and reliability engineering international. 2001;17(2):105-12.
68. Hazrati-Marangaloo H, Noorossana R. A nonparametric change detection approach in social networks. Quality and Reliability Engineering International. 2021;37(6):2916-35.
69. Achuthan K, Nair VK, Kowalski R, Ramanathan S, Raman R. Cyberbullying research—Alignment to sustainable development and impact of COVID-19: Bibliometrics and science mapping analysis. Computers in Human Behavior. 2023;140:107566.
70. Armitage CS, Lorenz M, Mikki S. Mapping scholarly publications related to the Sustainable Development Goals: Do independent bibliometric approaches get the same results? Quantitative Science Studies. 2020;1(3):1092-108.
71. Jayabalasingham B, Boverhof R, Agnew K, Klein L. Identifying research supporting the United Nations sustainable development goals. Mendeley Data. 2019;1(1).
72. Gijo EV, Antony J. Reducing patient waiting time in outpatient department using lean six sigma methodology. Quality and Reliability Engineering International. 2014;30(8):1481-91.
73. Sari JK, Newby MJ, Brombacher AC, Tang LC. Bivariate constant stress degradation model: LED lighting system reliability estimation with two-stage modelling. Quality and Reliability Engineering International. 2009;25(8):1067-84.
74. Han SW, Tsui KL, Ariyajunya B, Kim SB. A comparison of CUSUM, EWMA, and temporal scan statistics for detection of increases in Poisson rates. Quality and Reliability Engineering International. 2010;26(3):279-89.
75. Nichols MD, Padgett WJ. A bootstrap control chart for Weibull percentiles. Quality and reliability engineering international. 2006;22(2):141-51.
76. Braglia M, Frosolini M, Montanari R. Fuzzy TOPSIS approach for failure mode, effects and criticality analysis. Quality and reliability engineering international. 2003;19(5):425-43.
77. Box G, Bisgaard S, Fung C. An explanation and critique of Taguchi's contributions to quality engineering. Quality and reliability engineering international. 1988;4(2):123-31.
78. Brady JE, Allen TT. Six Sigma literature: a review and agenda for future research. Quality and reliability engineering International. 2006;22(3):335-67.
79. Robinson TJ, Borror CM, Myers RH. Robust parameter design: a review. Quality and reliability engineering international. 2004;20(1):81-101.
80. Antony J. Multi-response optimization in industrial experiments using Taguchi's quality loss function and principal component analysis. Quality and reliability engineering international. 2000;16(1):3-8.
81. Song W, Ming X, Wu Z, Zhu B. A rough TOPSIS approach for failure mode and effects analysis in uncertain environments. Quality and Reliability Engineering International. 2014;30(4):473-86.
82. Goh TN. A strategic assessment of Six Sigma. Quality and reliability engineering international. 2002;18(5):403-10.
83. Logothetis N, Haigh A. Characterizing and optimizing multi-response processes by the taguchi method. Quality and reliability engineering international. 1988;4(2):159-69.
84. Bian T, Zheng H, Yin L, Deng Y. Failure mode and effects analysis based on D numbers and TOPSIS. Quality and Reliability Engineering International. 2018;34(4):501-15.
85. Psarakis S, Vyniou AK, Castagliola P. Some recent developments on the effects of parameter estimation on control charts. Quality and Reliability Engineering International. 2014;30(8):1113-29.
86. Zhang B, Zhang L, Xu J. Degradation feature selection for remaining useful life prediction of rolling element bearings. Quality and Reliability Engineering International. 2016;32(2):547-54.
87. Jardine AK, Anderson PM, Mann DS. Application of the Weibull proportional hazards model to aircraft and marine engine failure data. Quality and reliability engineering international. 1987;3(2):77-82.
88. Kumar P, Barua PB, Gaindhar JL. Quality optimization (multi-characteristics) through Taguchi's technique and utility concept. Quality and Reliability Engineering International. 2000;16(6):475-85.
89. Ilzarbe L, Álvarez MJ, Viles E, Tanco M. Practical applications of design of experiments in the field of engineering: a bibliographical review. Quality and Reliability Engineering International. 2008;24(4):417-28.
90. Liu HC, Li P, You JX, Chen YZ. A novel approach for FMEA: combination of interval 2-tuple linguistic variables and gray relational analysis. Quality and Reliability Engineering International. 2015;31(5):761-72.
91. Niaki ST, Abbasi B. Fault diagnosis in multivariate control charts using artificial neural networks. Quality and reliability engineering international. 2005;21(8):825-40.
92. Sigurdsson JH, Walls LA, Quigley JL. Bayesian belief nets for managing expert judgement and modelling reliability. Quality and reliability engineering international. 2001;17(3):181-90.
93. Chen KS, Pearn WL, Lin PC. Capability measures for processes with multiple characteristics. Quality and Reliability Engineering International. 2003;19(2):101-10.
94. Zammori F, Gabbrielli R. ANP/RPN: A multi criteria evaluation of the risk priority number. Quality and Reliability Engineering International. 2012;28(1):85-104.
95. Coleman S, Göb R, Manco G, Pievatolo A, Tort-Martorell X, Reis MS. How can SMEs benefit from big data? Challenges and a path forward. Quality and Reliability Engineering International. 2016;32(6):2151-64.
96. Gijo EV, Scaria J, Antony J. Application of Six Sigma methodology to reduce defects of a grinding process. Quality and reliability engineering international. 2011;27(8):1221-34.
97. Pan R, Crispin T. A hierarchical modelling approach to accelerated degradation testing data analysis: A case study. Quality and reliability engineering international. 2011;27(2):229-37.
98. Yang SK, Liu TS. A Petri net approach to early failure detection and isolation for preventive maintenance. Quality and Reliability Engineering International. 1998;14(5):319-30.
99. Lin LC, Li TS, Kiang JP. A continual improvement framework with integration of CMMI and six-sigma model for auto industry. Quality and Reliability Engineering International. 2009;25(5):551-69.
100. Pignatiello Jr JJ, Simpson JR. A magnitude-robust control chart for monitoring and estimating step changes for normal process means. Quality and Reliability Engineering International. 2002;18(6):429-41.

Cite this article: Kumar C, Pattnaik D, Balas VE, Raman R. Comprehensive Scientometric Analysis and Longitudinal SDG Mapping of Quality and Reliability Engineering International Journal. J Scientometric Res. 2023;12(3):558-69.

Appendix (Supplementary Data)

Table S 1: Annual trend of publications and citations in *QREI* between 1985 and 2022.

Year	TP	SA	CA	NCA	CNAA	GA	AACA	ACI	ACC	TCP	TC	C/CP	*h*	*g*	*i-10*	*i-100*	*i-200*	PAY
1985	30	23	7	38	36	36	2.1	0.27	0.21	17	158	9.29	5	12	3	0	0	30
1986	34	23	11	49	77	41	2.4	0.44	0.31	19	122	6.42	6	10	4	0	0	32
1987	33	20	13	50	110	33	2.3	0.52	0.34	21	206	9.81	5	13	3	1	0	32
1988	39	16	23	72	162	52	2.4	0.85	0.46	30	685	22.83	10	13	10	2	0	34
1989	33	17	16	57	204	42	2.5	0.73	0.42	30	272	9.07	9	13	8	0	0	34
1990	35	17	18	64	244	40	2.6	0.83	0.45	29	369	12.72	10	13	11	0	0	34
1991	53	19	34	118	330	86	2.9	1.23	0.55	46	444	9.65	11	20	12	0	0	37
1992	58	15	43	151	444	114	3.2	1.60	0.62	45	562	12.49	11	23	13	0	0	39
1993	51	16	35	136	525	81	3.4	1.67	0.63	36	265	7.36	9	16	8	0	0	41
1994	53	25	28	132	597	72	3.8	1.49	0.60	38	373	9.82	9	18	9	0	0	42
1995	52	14	38	128	670	73	3.0	1.46	0.59	42	542	12.90	13	22	17	0	0	43
1996	60	10	50	182	759	89	3.4	2.03	0.67	45	459	10.20	12	21	16	0	0	44
1997	45	8	37	99	815	56	2.5	1.20	0.55	34	852	25.06	16	14	22	1	0	44
1998	57	24	33	129	890	75	3.2	1.26	0.56	46	537	11.67	14	23	19	0	0	45
1999	52	14	38	122	973	83	2.8	1.35	0.57	48	790	16.46	16	26	27	0	0	46
2000	51	11	40	120	1050	77	2.7	1.35	0.58	47	1,055	22.45	18	31	23	2	0	46
2001	47	13	34	104	1108	58	2.7	1.21	0.55	46	1,262	27.43	20	34	33	3	0	46
2002	47	9	38	111	1178	70	2.7	1.36	0.58	43	1,177	27.37	21	33	31	1	0	46
2003	31	8	23	72	1214	36	2.8	1.32	0.57	31	1,131	36.48	18	31	25	3	1	45
2004	42	11	31	94	1265	51	2.7	1.24	0.55	40	911	22.78	17	29	24	1	0	45
2005	55	10	45	139	1360	95	2.9	1.53	0.60	54	1,279	23.69	21	34	38	1	0	46
2006	59	5	54	147	1458	98	2.6	1.49	0.60	57	1,548	27.16	20	38	36	2	1	46
2007	39	3	36	110	1528	70	3.0	1.82	0.65	38	1,785	46.97	18	38	30	3	2	46
2008	49	8	41	127	1613	85	2.9	1.59	0.61	44	996	22.64	19	30	30	1	0	46
2009	67	11	56	175	1723	110	2.9	1.61	0.62	65	1,300	20.00	18	32	45	0	0	47
2010	58	7	51	144	1817	94	2.7	1.48	0.60	57	1,101	19.32	19	31	31	0	0	47
2011	75	3	72	203	1937	120	2.8	1.71	0.63	74	1,677	22.66	25	38	44	0	0	48
2012	70	8	62	185	2059	122	2.9	1.64	0.62	69	1,549	22.45	22	36	41	1	0	49
2013	95	7	88	276	2215	156	3.1	1.91	0.66	92	2,094	22.76	27	40	66	1	0	51
2014	101	11	90	290	2390	175	3.1	1.87	0.65	99	2,026	20.46	24	39	63	3	0	52
2015	122	15	107	336	2552	162	3.0	1.75	0.64	117	1,972	16.85	24	35	67	1	0	55
2016	221	23	198	648	2917	365	3.2	1.93	0.66	214	3,146	14.70	29	40	111	1	0	60
2017	191	24	167	544	3179	262	3.1	1.85	0.65	187	2,097	11.21	23	29	85	0	0	64
2018	126	9	117	374	3360	181	3.1	1.97	0.66	117	1,282	10.96	17	26	50	1	0	66
2019	169	10	159	528	3619	259	3.3	2.12	0.68	158	1,457	9.22	19	23	60	0	0	69
2020	154	13	141	484	3849	230	3.3	2.14	0.68	149	1,124	7.54	16	20	40	0	0	71
2021	214	15	199	718	4162	313	3.5	2.36	0.70	172	681	3.96	11	13	13	0	0	75
2022	210	12	198	727	4523	361	3.6	2.46	0.71	64	113	1.77	4	5	0	0	0	78

Notes: TP=total publications, SA=sole-authored articles, CA=co-authored articles, NCA=number of contributing authors, CNAA=cumulative number of affiliated authors, GA=growth in authorship, AACA=average authors per co-authored article, ACI=annual collaboration index, ACC=annual collaboration coefficient, TCP=total cited publications, TC=total citations, C/CP=citations per cited publication, *h*=*h*-index, *g*=*g*-index, *i-10*=*i-10* index, *i-100*=*i-100* index, *i-200*=*i-200* index, and PAY=Productivity per Active Year.

Table S2: Top articles published in *QREI* between 1985 and 2022.

TC	Author	Title
445	Bersimis *et al.* (2007)[50]	"Multivariate statistical process control charts: An overview".
280	Nichols and Padgett (2006)[75]	"A bootstrap control chart for weibull percentiles".
253	Braglia *et al.* (2003)[76]	"Fuzzy TOPSIS Approach for Failure Mode, Effects and Criticality Analysis".
250	Mahmoud *et al.* (2007)[51]	"A change point method for linear profile data".
230	Williams *et al.* (2007)[47]	"Statistical monitoring of nonlinear product and process quality profiles".
210	Box *et al.* (1988)[77]	"An explanation and critique of taguchi's contributions to quality engineering".
197	Brady and Allen (2006)[78]	"Six Sigma literature: A review and agenda for future research".
196	Robinson *et al.* (2004)[79]	"Robust parameter design: A review".
192	Antony (2000)[80]	"Multi-response optimization in industrial experiments using Taguchi's quality loss function and principal component analysis".
183	Levitin and Lisnianski (2001)[45]	"A new approach to solving problems of multi-state system reliability optimization".
175	Tong and Su (1997)[48]	"Optimizing multi-response problems in the Taguchi method by fuzzy multiple attribute decision making".
172	Ye and Chen (2001)[67]	"An anomaly detection technique based on a chi-square statistic for detecting intrusions into information systems".
165	Song *et al.* (2014)[81]	"A rough TOPSIS approach for failure mode and effects analysis in uncertain environments".
158	Goh (2002)[82]	"A strategic assessment of Six Sigma".
144	Logothetis and Haigh (1988)[83]	"Characterizing and optimizing multi-response processes by the Taguchi method".
138	Abbas *et al.* (2013)[53]	"Mixed exponentially weighted moving average-cumulative sum charts for process monitoring".
135	Bian *et al.* (2018)[84]	"Failure mode and effects analysis based on D numbers and TOPSIS".
134	Psarakis *et al.* (2014)[85]	"Some recent developments on the effects of parameter estimation on control charts".
132	Zhang *et al.* (2016)[86]	"Degradation feature selection for remaining useful life prediction of rolling element bearings".
131	Jardine *et al.* (1987)[87]	"Application of the Weibull proportional hazards model to aircraft and marine engine failure data".
119	Kumar *et al.* (2000)[88]	"Quality optimization (multi-characteristics) through Taguchi's technique and utility concept".
118	Huang and Askin (2003)[44]	"Reliability analysis of electronic devices with multiple competing failure modes involving performance aging degradation".
112	Ilzarbe *et al.* (2008)[89]	"Practical applications of design of experiments in the field of engineering: A bibliographical review".
109	Liu *et al.* (2015)[90]	"A novel approach for FMEA: Combination of Interval 2-Tuple Linguistic Variables and Gray Relational Analysis".
108	Niaki and Abbasi (2005)[91]	"Fault diagnosis in multivariate control charts using artificial neural networks".
106	Sigurdsson *et al.* (2001)[92]	"Bayesian belief nets for managing expert judgement and modelling reliability".
105	Gijo and Antony (2014)[72]	"Reducing patient waiting time in outpatient department using Lean Six Sigma Methodology".
103	Chen *et al.* (2003)[93]	"Capability measures for processes with multiple characteristics".
100	Zammori and Gabbrielli (2012)[94]	"ANP/RPN: A multi criteria evaluation of the risk priority number".

Note: This table enlists the *QREI* publications cited at least 100 times in Scopus on the search date.

Table S3: Top authors publishing in *QREI* between 1985 and 2022.

Author	TP	SA	CA	NCA	AACA	ACI	ACC	TCP	TC	C/CP	*h*	*g*	*i-10*	*i-100*	*i-200*	NAY	PAY
Muhammad Riaz	77	2	75	295	3.9	2.8	0.74	71	1,672	24	23	37	52	1	0	22	4
Philippe Castagliola	56	1	55	197	3.6	2.5	0.72	53	1,364	26	22	35	40	1	0	28	2
Douglas C. Montgomery	52	0	52	174	3.3	2.3	0.70	47	887	19	18	28	28	0	0	25	2
Michael Boon Chong Khoo	51	1	50	188	3.7	2.7	0.73	42	807	19	19	27	28	0	0	18	3
Abdul Haq	48	9	39	119	2.8	1.5	0.60	44	694	16	18	24	27	0	0	15	3
Fu-Kwun Wang	41	10	31	83	2.4	1.0	0.51	39	363	9	11	16	14	0	0	14	3
Saddam Akber Abbasi	33	3	30	110	3.6	2.3	0.70	30	521	17	13	22	16	0	0	16	2
Christine M. Anderson-Cook	33	0	33	98	3.0	2.0	0.66	28	295	11	10	16	10	0	0	17	2
Rassoul Noorossana	29	1	28	83	2.9	1.9	0.65	27	586	22	15	24	19	0	0	15	2
Min Xie	28	0	28	91	3.3	2.3	0.69	26	654	25	17	25	21	0	0	11	3
Thong Ngee Goh	27	12	15	56	2.9	1.1	0.52	27	546	20	11	23	11	1	0	10	3
Michael S. Hamada	25	4	21	64	2.9	1.6	0.61	20	189	9	7	13	6	0	0	12	2
Linda Lee Ho	25	0	25	75	3.0	2.0	0.67	21	165	8	8	11	5	0	0	16	2
William H. Woodall	24	0	24	80	3.3	2.3	0.70	24	1,293	54	16	24	19	2	2	16	2
Nasir Abbas	23	2	21	82	3.8	2.6	0.72	21	684	33	12	21	14	1	0	16	1
Amirhossein Amiri	23	0	23	71	3.1	2.1	0.68	21	508	24	12	21	14	0	0	17	1
Connie M. Borror	23	0	23	78	3.4	2.4	0.71	21	676	32	15	21	17	1	0	12	2
Ronald J. M. M. Does	23	0	23	77	3.3	2.3	0.70	22	786	36	15	22	18	1	0	7	3
Wen Lea Pearn	23	0	23	62	2.7	1.7	0.63	23	572	25	15	23	18	1	0	9	3
Muhammad Aslam	21	1	20	79	3.9	2.8	0.73	20	214	11	9	14	8	0	0	10	2
Christos Koukouvinos	21	0	21	56	2.7	1.7	0.63	18	142	8	8	10	6	0	0	10	2
Hafiz Zafar Nazir	21	0	21	107	5.1	4.1	0.80	18	320	18	12	17	13	0	0	12	2
Subha Chakraborti	20	0	20	55	2.8	1.8	0.64	19	390	21	9	19	9	0	0	10	2
Aarnout C. Brombacher	19	0	19	86	4.5	3.5	0.78	17	330	19	10	17	11	0	0	9	2
Seyed Taghi Akhavan Niaki	18	0	18	48	2.7	1.7	0.63	18	354	20	9	18	9	1	0	10	2
XueLong Hu	17	0	17	70	4.1	3.1	0.76	13	189	15	7	13	6	0	0	10	2
George C. Runger	17	0	17	52	3.1	2.1	0.67	16	445	28	12	16	13	0	0	9	2
Muhammad Abid	16	0	16	83	5.2	4.2	0.81	13	242	19	10	13	10	0	0	7	2
Amitava Mukherjee	15	0	15	49	3.3	2.3	0.69	12	326	27	8	12	7	0	0	3	5

Notes: This table ranks the top authors publishing at least 15 articles in *QREI*. Here, TP=total publications, SA=sole-authored articles, CA=co-authored articles, NCA=number of contributing authors, AACA=average authors per co-authored article, CI=collaboration index, CC=collaboration coefficient, TCP=total cited publications, TC=total citations, C/CP=citations per cited publication, *h*=*h*-index, *g*=*g*-index, *i-10*=*i-10* index, NAY=number of active years, and PAY=productivity per active year.

Table S4: Top countries affiliated with *QREI* authors between 1985 and 2022.

Country	TP	SA	CA	NCA	AACA	CI	CC	TCP	TC	C/CP	*h*	*g*	*i-10*	*i-100*	*i-200*	NAY	PAY
United States	858	147	711	2,260	3.0	1.6	0.62	745	12,906	17	50	77	354	10	5	38	23
China	427	10	417	1,577	3.8	2.7	0.73	364	5,084	14	32	49	167	4	0	26	16
United Kingdom	264	83	181	607	2.9	1.3	0.57	216	3,595	17	32	51	86	4	0	38	7
Taiwan	208	39	169	485	2.6	1.3	0.57	195	2,949	15	28	40	105	2	0	29	7
Pakistan	152	16	136	486	3.5	2.2	0.69	133	2,267	17	27	39	74	1	0	12	13
Italy	150	19	131	458	3.4	2.1	0.67	137	2,264	17	23	40	64	2	1	33	5
France	145	6	139	549	3.9	2.8	0.74	119	2,285	19	28	41	65	1	0	28	5
India	140	9	131	388	2.9	1.8	0.64	118	2,328	20	26	42	68	3	0	27	5
Iran	130	7	123	359	2.9	1.8	0.64	117	1,929	16	25	36	63	1	0	22	6
Saudi Arabia	128	9	119	456	3.8	2.6	0.72	118	1,979	17	24	37	66	1	0	15	9
Netherlands	88	6	82	294	3.5	2.3	0.70	78	1,717	22	21	39	43	2	1	28	3
Germany	87	20	67	269	3.7	2.1	0.68	71	640	9	13	22	18	0	0	27	3
Canada	83	9	74	265	3.5	2.2	0.69	75	1,651	22	24	38	46	1	0	30	3
Singapore	76	15	61	201	3.0	1.6	0.62	74	1,613	22	24	37	44	1	0	29	3
Korea	75	1	74	214	2.9	1.9	0.65	68	758	11	15	23	26	0	0	24	3
Malaysia	75	1	74	270	3.6	2.6	0.72	64	1,103	17	20	29	41	0	0	19	4
Brazil	70	3	67	212	3.1	2.0	0.67	58	833	14	15	26	25	0	0	21	3
Sweden	58	13	45	150	3.0	1.6	0.61	52	1,086	21	21	31	31	0	0	31	2
Greece	55	5	50	144	2.8	1.6	0.62	48	1,162	24	13	33	22	2	1	21	3
Israel	51	18	33	105	2.6	1.1	0.51	45	667	15	13	24	17	1	0	27	2
Spain	49	1	48	161	3.3	2.3	0.70	44	624	14	13	23	14	1	0	18	3
Belgium	42	1	41	171	4.1	3.1	0.75	38	441	12	14	19	20	0	0	22	2
South Africa	42	4	38	117	3.0	1.8	0.64	37	462	12	13	19	17	0	0	16	3
Turkey	36	7	29	82	2.6	1.3	0.56	31	528	17	13	22	16	0	0	14	3
Australia	35	8	27	90	3.0	1.6	0.61	29	213	7	8	13	7	0	0	19	2
Japan	35	3	32	115	3.5	2.3	0.70	25	355	14	9	18	9	0	0	20	2
New Zealand	35	2	33	109	3.2	2.1	0.68	28	594	21	15	24	20	0	0	13	3
Egypt	34	1	33	98	2.9	1.9	0.65	30	727	24	11	26	14	1	1	13	3
Mexico	34	3	31	112	3.5	2.3	0.70	28	305	11	10	16	11	0	0	16	2
Denmark	31	11	20	68	2.9	1.2	0.54	27	318	12	10	17	10	0	0	23	1
Qatar	26	2	24	87	3.5	2.3	0.70	22	171	8	7	11	6	0	0	7	4

Notes: This table shows the top *QREI* authors' affiliated countries. Here, TP=total publications, SA=sole-authored articles, CA=co-authored articles, NCA=number of contributing authors, NAA=number of affiliated authors, AACA=average authors per co-authored article, CI=collaboration index, CC=collaboration coefficient, TCP=total cited publications, TC=total citations, C/CP=citations per cited publication, *h*=*h*-index, *g*=*g*-index, *i-10*=*i-10* index, NAY=number of active years, and PAY=Productivity per Active Year.

Table S5: Top journals and subject areas frequently citing *QREI*.

Rank	Source	TC	Subject Area	TC
1	Quality and Reliability Engineering International.	1,834	Engineering	14,849
2	Reliability Engineering and System Safety.	654	Computer Science	6,380
3	Computers and Industrial Engineering.	388	Decision Sciences	5,229
4	International Journal of Advanced Manufacturing Technology.	376	Mathematics	5,049
5	International Journal of Production Research.	343	Business, Management, and Accounting	3,266
6	Quality Engineering.	329	Materials Science	1,782
7	Communications in Statistics Simulation and Computation.	295	Physics and Astronomy	1,486
8	Communications in Statistics Theory and Methods.	292	Social Sciences	892
9	IEEE Transactions on Reliability.	251	Energy	881
10	Journal of Quality Technology.	250	Environmental Science	741
11	International Journal of Quality and Reliability Management.	237	Chemical Engineering	719
12	IEEE Access.	231	Chemistry	537
13	Journal of Statistical Computation and Simulation.	213	Economics, Econometrics, and Finance	436
14	Quality Technology and Quantitative Management.	172	Medicine	398
15	Journal of Applied Statistics.	168	Earth and Planetary Sciences	395
16	Proceedings of the Institution of Mechanical Engineers Part O Journal of Risk and Reliability.	160	Agricultural and Biological Sciences	315
17	Expert Systems with Applications.	154	Biochemistry, Genetics, and Molecular Biology	305
18	European Journal of Operational Research.	152	Arts and Humanities	120
19	Microelectronics Reliability.	152	Health Professions	86
20	Mathematical Problems in Engineering.	131	Pharmacology, Toxicology, and Pharmaceutics	69

Notes: This table ranks the top sources and subject areas frequently citing the works published in *QREI* on the search date.

Table S6: Top authors' affiliations frequently citing *QREI* between 1985 and 2022.

R	Affiliation	TC	Country	TC
1	Beihang University	370	China	3631
2	Universiti Sains Malaysia	245	United States	1524
3	King Fahd University of Petroleum and Minerals	229	India	820
4	City University of Hong Kong	176	Iran	802
5	King Abdulaziz University	176	Italy	571
6	Nantes Université	167	Pakistan	533
7	Laboratoire des Sciences du Numérique de Nantes	161	Saudi Arabia	533
8	Ministry of Education China	158	Taiwan	476
9	Quaid-i-Azam University	156	France	467
10	University of Electronic Science and Technology of China	149	United Kingdom	462
11	Nanjing University of Science and Technology	137	Malaysia	433
12	Shanghai Jiao Tong University	137	Brazil	396
13	Virginia Polytechnic Institute and State University	133	Canada	388
14	Chongqing University	129	South Korea	353
15	Shahed University	129	Spain	279
16	Tianjin University	129	Germany	246
17	Northwestern Polytechnical University	125	Hong Kong	240
18	Xi'an Jiaotong University	115	Turkey	231
19	Politecnico di Milano	106	Australia	214
20	Qatar University	102	Greece	191

Notes: This table shows the top authors' affiliations citing QREI publications between 1978 and 2022. Here, R = Rank and TC = Total Citations.

Table S7: Co-authorships trends in *QREI* between 1985 and 2022.

NA	1985-1992	1993-2002	2003-2012	2013-2022
1	150	144	74	139
2	102	180	227	424
3	30	103	152	493
4	21	42	68	340
5	6	26	18	155
>5	6	26	6	52
SA	48%	28%	14%	9%
CA	52%	72%	86%	91%
CI	0.81	1.44	1.54	2.04
CC	0.42	0.59	0.61	0.67
AACA	2.55	3.02	2.82	3.23

Notes: NA: Number of Authors, SA-Sole-author Articles, CA-Co-authored Articles, AACA=average authors per co-authored article.

Table S8: Top collaborations in *QREI*.

Country 1	Country 2	TP
Pakistan	Saudi Arabia	70
United States	Iran	67
United States	Taiwan	36
United States	Korea	28
United States	India	27
Italy	France	26
Pakistan	Malaysia	23
China	Taiwan	21
United States	Mexico	19
United States	Iran	18
France	Malaysia	17
United States	United Kingdom	16
China	France	15
China	Canada	14
China	India	14
China	Pakistan	14
United States	Canada	14
United States	Netherlands	12
China	Saudi Arabia	10
China	Singapore	10
Italy	United States	10
United States	Germany	10
United States	Italy	10

Note: This table shows the top collaborations among QREI authors' affiliated nations. Here, TP=Total Publications.

Table S9: Top *QREI* articles related to SDG9, SDG7, and SDG3.

TC	Author	Title	SDG focus
106	Gijo and Antony (2014)[72]	"Reducing patient waiting time in outpatient department using lean six sigma methodology"	9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
104	Coleman et al. (2016)[95]	"How can SMEs benefit from big data? Challenges and a path forward"	
93	Gijo et al. (2011)[96]	"Application of six sigma methodology to reduce defects of a grinding process"	
81	Sari et al. (2009)[73]	"Bivariate constant stress degradation model: Led lighting system reliability estimation with two-stage modelling"	7 AFFORDABLE AND CLEAN ENERGY
43	Pan and Crispin (2011)[97]	"A hierarchical modelling approach to accelerated degradation testing data analysis: A case study"	
40	Yang and Liu (1998)[98]	"A Petri net approach to early failure detection and isolation for preventive maintenance"	
48	Han et al. (2010)[74]	"A comparison of CUSUM, EWMA, and temporal scan statistics for detection of increases in Poisson rates"	3 GOOD HEALTH AND WELL-BEING
25	Lin et al. (2009)[99]	"A continual improvement framework with integration of CMMI and six-sigma model for auto industry"	
25	Pignatiello and Simpson (2002)[100]	"A magnitude-robust control chart for monitoring and estimating step changes for normal process means"	

Note: This table reveals the top three QREI articles that relates to SDG9, SDG7, and SDG3.

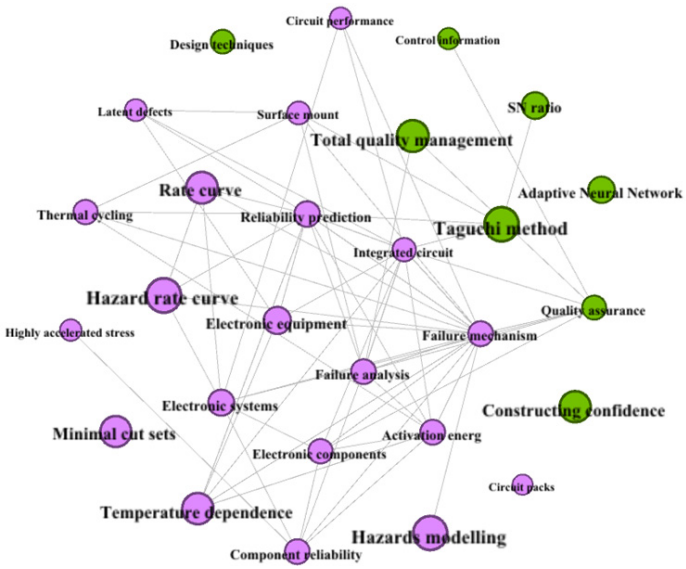

Figure S1: Influential topics published in *QREI* with APY between 1985.0 and 2000.0.

Notes: Nodes = topic represented by bigram or trigram. Color of nodes=thematic cluster of nodes where, cluster 1 (purple), cluster 2 (green), cluster 3 (blue), cluster 4 (black), cluster 5 (orange), cluster 6 (red), cluster 7 (deep green), cluster 8 (suave), cluster 9 (off grey), and cluster 10 (grey). Size of nodes=citations garnered by a topic. Link=co-occurrence between nodes.

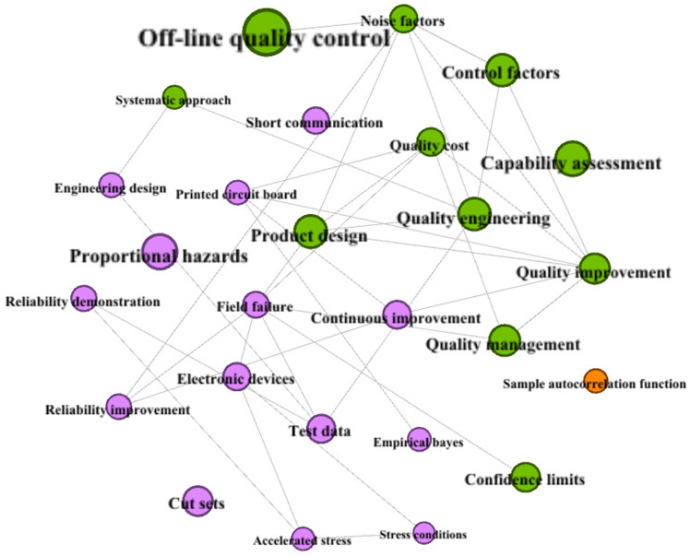

Figure S2: Influential topics published in *QREI* with APY between 2000.1 and 2005.0.

Notes: Nodes=topic represented by bigram or trigram. Color of nodes=thematic cluster of nodes where, cluster 1 (purple), cluster 2 (green), cluster 3 (blue), cluster 4 (black), cluster 5 (orange), cluster 6 (red), cluster 7 (deep green), cluster 8 (suave), cluster 9 (off grey), and cluster 10 (grey). Size of nodes=citations garnered by a topic. Link=co-occurrence between nodes.

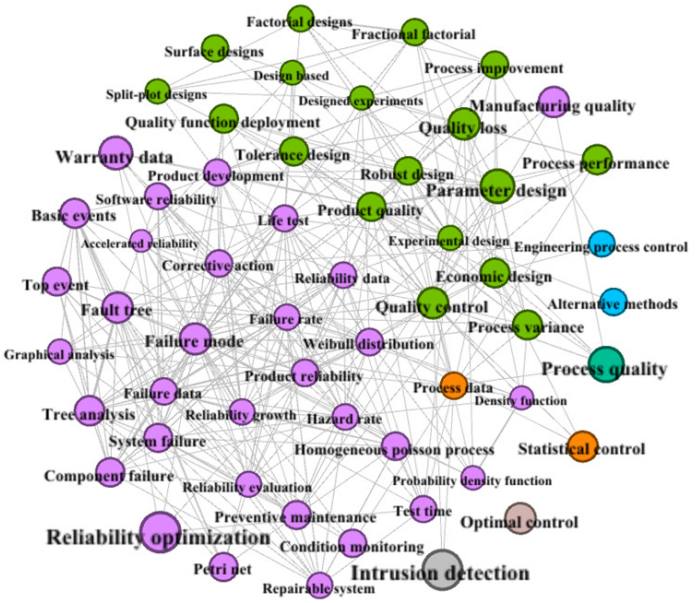

Figure S3: Influential topics published in *QREI* with APY between 2005.1 and 2010.0.

Notes: Nodes=topic represented by bigram or trigram. Color of nodes=thematic cluster of nodes where, cluster 1 (purple), cluster 2 (green), cluster 3 (blue), cluster 4 (black), cluster 5 (orange), cluster 6 (red), cluster 7 (deep green), cluster 8 (suave), cluster 9 (off grey), and cluster 10 (grey). Size of nodes=citations garnered by a topic. Link=co-occurrence between nodes.

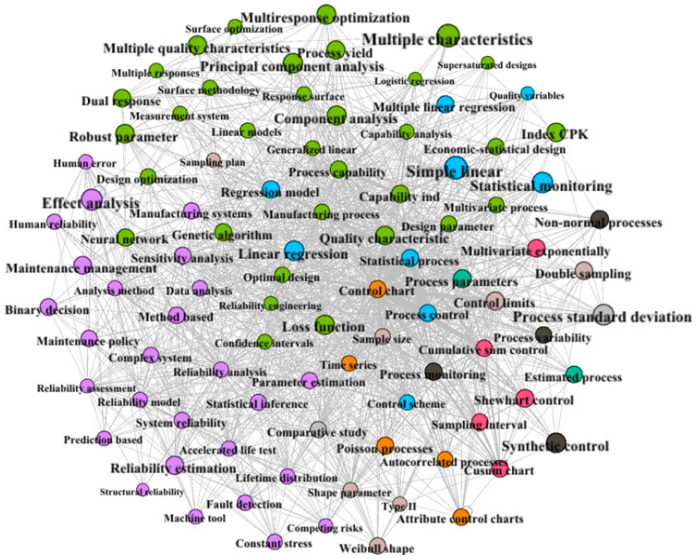

Figure S4: Influential topics published in *QREI* with APY between 2010.1 and 2015.0.

Notes: Nodes=topic represented by bigram or trigram. Color of nodes=thematic cluster of nodes where, cluster 1 (purple), cluster 2 (green), cluster 3 (blue), cluster 4 (black), cluster 5 (orange), cluster 6 (red), cluster 7 (deep green), cluster 8 (suave), cluster 9 (off grey), and cluster 10 (grey). Size of nodes=citations garnered by a topic. Link=co-occurrence between nodes.

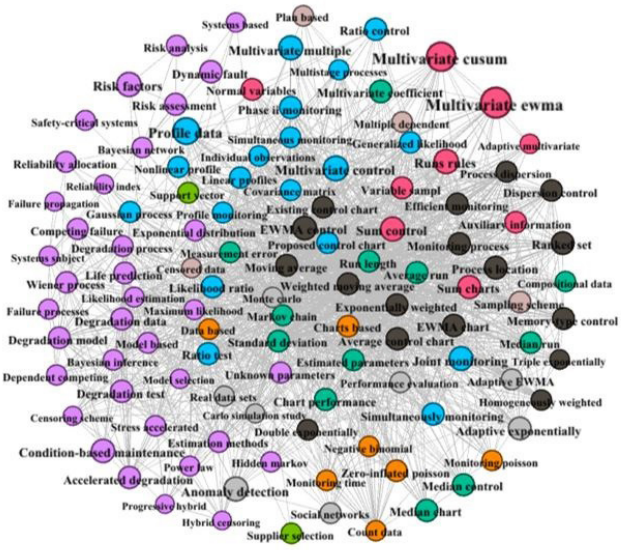

Figure S5: Influential topics published in QREI with APY between 2015.1 and 2022.0.

Notes: Nodes=topic represented by bigram or trigram. Color of nodes=thematic cluster of nodes where, cluster 1 (purple), cluster 2 (green), cluster 3 (blue), cluster 4 (black), cluster 5 (orange), cluster 6 (red), cluster 7 (deep green), cluster 8 (suave), cluster 9 (off grey), and cluster 10 (grey). Size of nodes=citations garnered by a topic. Link=co-occurrence between nodes.