Fallacy of continual improvement in the longitudinal study of ISO 9001 and IATF 16949 standards

Neeraj Yadav
Qualcon Consultancy Co, Jaipur, India, and
Pantri Heriyati
Department of Management, Binas Business School, Jakarta, Indonesia

Abstract

Purpose – Generic quality management system standard ISO 9001 and the automotive quality management system standard IATF 16949 both require organisations to demonstrate continual improvement in their customer satisfaction and the number of non-conformities identified during quality system audits. However, the long-term trends of these two parameters under ISO 9001 and IATF 16949 standards are not researched so far. It is expected that under continual improvement, organisations will achieve a step-function/stair-case shaped pattern. This study evaluates if this expectation is true when long-term performance of certified organisations is assessed.

Design/methodology/approach – A longitudinal exploration of three organisations certified to ISO 9001 standard and three certified to IATF 16949 standard is done. The observations are further substantiated using secondary data for the same ten years period about customer satisfaction of the major automobile manufacturers.

Findings – It is observed that none of the two indicators, i.e. the customer satisfaction and number of non-conformities, in any of the six organisations show step-wise/stair-case type improvement. All indicators followed random up and down patterns like ocean waves. It is paradoxical that certified organisations are claiming continual improvement and are remaining certified but there is actually no long-term improvement.

Originality/value – Longitudinal studies for the generic quality management standard ISO 9001 and the quality system standard for automotive sector IATF 16949 are rare. The revelation about ocean wave patterns observed in the long-term trends for customer satisfaction and the number of non-conformities in ISO 9001 and IATF 16949 certified organisations is a startling finding. It is outlandishly different from the conventional perception of a staircase-styled continual improvement pattern expected \textit{a priori} in certified organisations.

Keywords IATF 16949, ISO 9001, Longitudinal study, Continual improvement, Customer satisfaction,

Quality management system paradox

Paper type Research paper

1. Introduction

ISO 9001 is one of the most successful quality management system standards in the world, with over one million certificates issued worldwide (ISO Survey, 2022). It is a generic quality management system standard and can be used by organisations of any size, nature, or sector (Plura, 2000). One of the requirements to be fulfilled by the organisations certified to this standard is continual improvement in performance (Domingues \textit{et al}., 2019; Kartha, 2004). Continual improvement in this standard is defined as “recurring activity to enhance performance” [1]. It differs from continuous improvement, which is improvement without a break (ASQ, 2022; Towers, 2020). It is assumed that quality system elements such as

The authors thank the editor, the editorial team and the two anonymous referees for their time, review and insightful suggestions which helped in enhancing the appeal and value of this manuscript.

\textbf{Funding Support:} Authors received research collaboration grant from Binus University under grant no. 017/VR-RTT/III/2021.

\textbf{Conflict of Interest/Declaration:} None.
non-conformities, rejection, productivity, customer satisfaction, etc. cannot improve consistently without stabilising at a particular level for some time. Organisations achieve a certain performance level, maintain it for some time and then achieve a better performance level in next phase of the improvement cycle. As a result, continual improvement follows a staircase/step-function shaped improvement pattern as shown in Figure 1 (ASQ, 2022; Towers, 2020). According to Cândido et al. (2021), many studies suggest that not only does ISO 9001 certification improve the performance of a firm, but this improvement also accrues over time, i.e. the improvement is continual. However, they observed a new trend of ISO 9001 certificate withdrawal, which contradicts such claims. Further research about why quality system standards are not achieving consistent success is therefore recommended by Cândido et al. (2021).

Some business sectors have additional and more stringent requirements than those prescribed in the ISO 9001 standard to meet their quality requirements. The automotive industry therefore uses another standard called IATF 16949, which uses ISO 9001 as a base standard and has additional requirements which are either completely new or more rigorous than ISO 9001 requirements (Chen and Chang, 2017; Lahidji and Tucker, 2016; Laskurain-Iturbe et al., 2021). For example, in ISO 9001, the requirement prescribed for an organisation to be certified is to demonstrate continual improvement in its performance. However, how the organisation achieves it is left to the organisation. IATF 16949, on the other hand, requires a documented process for continual improvement and also specifies some parameters in which continual improvement is to be demonstrated (ISO 9001, 2015; IATF, 2016).

It is therefore expected that organisations that have been certified to these standards for an extended period of time must have consistently improved their performance during this time. However, this assumption requires verification. Previous studies in this aspect have mainly focused on verifying the performance before certification and after certification to establish if continual improvement was achieved or not as a result of certification. However, whether this continual improvement is sustained during the certification period and after achieving certification requires long-term study of certified organisations. Another research question that comes up from this thought is whether the continual improvement pattern in certified organisations really resembles the staircase/step-function pattern as prescribed in these standards (see Figure 1)? Or is there a fallacy between the actual and expected performance improvement pattern of the organisations certified to ISO 9001 and IATF 16949 quality management system standards?

Longitudinal studies can be used to research the long-term performance of firms certified to these quality system standards. The scarcity of longitudinal studies about quality management systems is already recognized (Astrini, 2021). Some research using this methodology has been done for ISO 9001 (Allur et al., 2014; Terziovski et al., 2003; Zimon and...
Dellana, 2020), but no such study is evident for IATF 16949. Kusumah and Fabianto (2018) did a longitudinal analysis of ISO 9001 for one certification cycle, i.e. three years after certification, but it remained focused on the financial performance of the firms. This study did not cover the IATF 16949 standard. Lo and Yeung (2018) did a six-year longitudinal study of ISO 9001 certified firms. In this investigation, the firms’ performance for the three years before acquiring ISO 9001 certification was compared with their performance for the three years after acquiring certification. They observed paradoxical results. As the time period after acquiring ISO 9001 certification increased, operational efficiency and shareholder value declined, although sales revenue increased. It is noteworthy that ISO 9001 does not mandatorily require firms to monitor operational efficiency and shareholder value. Apart from the longitudinal study, other research that explored performance improvement in organisations due to quality management systems predominantly used feedback and perception ratings rather than real numbers from organisations (Arumugam et al., 2008; Chen and Chang, 2017; Chiarini et al., 2020; Eve and Sprimont, 2016; Psomas, 2013; Yadav et al., 2020; Zayas-Mateo and Martínez-Lorente, 2021).

To investigate the continual improvement patterns of organisations certified to ISO 9001 and IATF 16949 standards, two parameters were chosen in this study. These two parameters are customer satisfaction and the number of non-conformities reported during periodic audits by the certification agencies. Customer satisfaction is one of the most important indicators of business performance (Yadav and Al Owad, 2022; Yadav et al., 2020). It is also one of the key requirements to be fulfilled in both the ISO 9001 and IATF 16949 standards (Domingues et al., 2019; Pačiaiová and Ižariková, 2019; Usman et al., 2019). The degree of compliance with a quality management system is reflected by the number of non-conformities reported through system audits performed by management system certification agencies (Chumba et al., 2019; Nikolay, 2016).

A review of available literature indicates that no effort is made to present these numbers directly through a longitudinal study of either the ISO 9001 or IATF 16949 standards. The trends of these two very important indicators are therefore researched in this study. Longitudinal research is conducted among six different organisations. Three of these organisations are certified to the generic quality management system standard ISO 9001, and three are certified to the automotive quality management system standard IATF 16949.

The research is presented in five sections. A literature review of this research is presented in section 2. The approach followed for this study is explained in section 3. Data obtained over a ten-year period from different organisations is presented and analysed in section 4. The discussion and implications of the findings are provided in section 5, along with the limitations and directions for further research.

2. Literature review
This section first provides details about the two standards investigated in this research, i.e. the generic quality management system standard ISO 9001 and the automotive quality management system standard IATF 16949. It also explains the requirements in these standards about continual improvement as well as the requirements related to the chosen parameters for studying continual improvement, i.e. customer satisfaction and the number of system non-conformities reported by the certification agencies for these standards.

**ISO 9001:** The ISO 9001 quality management system (QMS) was first released as a standard in 1987. It was subsequently revised in 1994, 2000, 2008 and 2015. The current version of this standard is ISO 9001:2015 (Domingues et al., 2019; Zayas-Mateo and Martínez-Lorente, 2021). Although it still remains one of the most successful quality management system standards worldwide, its popularity is fading (ISO Survey, 2022). The effectiveness of ISO 9001 is gradually becoming an area of concern worldwide (Sun et al., 2019). Kusumah and
Fabianto (2018) concluded that there is no conclusive evidence of a difference in the financial performance of ISO 9001 certified firms and non-certified firms. Many organisations are either surrendering their certificates or abandoning the certification drive (Cândido and Ferreira, 2022, 2023; Chiariini, 2019; Ferreira and Cândido, 2021; Simon and Kafel, 2018). The rate of non-renewal of ISO 9001 certifications is growing (Cândido et al., 2021). Some of the reasons for this trend are difficulties in achieving continual improvement; increased system non-conformities/failure to comply with system requirements (Cândido and Ferreira, 2023); customer disinterest (Chiariini, 2019); and compromised auditing practices (Yadav et al., 2022).

IATF 16949: Since ISO 9001 is a generic quality management system, the automotive sector realised a need for a more specific and elaborate standard. In the year 1994, the Big-Three i.e. the three largest automobile manufacturers of the world; General Motors, Ford and Chrysler released QS 9000 standard which was based on the ISO 9001 standard but with additional automotive requirements (Kartha, 2004). On a similar pattern, some other automotive standards were also launched in other parts of the world, e.g. VDA in Germany. These multiple automotive quality systems created chaos among suppliers and eventually a common specification was released as ISO/TS 16949 (Chen and Chang, 2017; Franceschini et al., 2011; Paçaiová and Ižaríková, 2019). It was developed by the International Organisation for Standardization (ISO) based on ISO 9001 and automotive industry requirements. In the year 2016, the International Automotive Task Force (IATF) took responsibility for automotive requirements, its certification norms, auditing guidelines etc. And let ISO 9001 requirements remain under control of ISO. Together these requirements represent automotive quality management standard IATF 16949 (Chen and Chang, 2017; Lahidji and Tucker, 2016; Laskurain-Iturbe et al., 2021). The latest version of this standard remains IATF 16949:2016.

2.1 Requirements related to continual improvement in ISO 9001 and IATF 16949 standards
In the year 2000 revision of ISO 9001, continual improvement was introduced as a requirement for certification. This requirement continued in the 2008 revision as well as in the current version, i.e. ISO 9001:2015 (Domingues et al., 2019; Zayas-Mateo and Martínez-Lorente, 2021). Since IATF 16949:2016 uses the requirements of ISO 9001:2015 as its base requirements, the continual improvement requirements of ISO 9001:2015 automatically become essential requirements of IATF 16949:2016. As explained in the previous section, section-1 (Introduction), continual improvement is expected to follow a step-by-step/staircase-pattern improvement trend in performance parameters (see Figure 1). The continual improvement term used in ISO 9001 is explained in ISO 9000 (the document that defines the terminology used in ISO 9001 standard), and it is defined as “recurring activity to enhance performance” [1]. Broadly two approaches are used for continual improvement; breakthrough improvement and incremental improvement often termed as Kaizen (Plura, 2000). Singh and Singh (2015) described the history of continual improvement tools, barriers for continual improvement and types of Kaizens.

The requirements related to continual improvement are covered in clause 10.3 of ISO 9001:2015. These requirements say that the organisation certified/seeking certification to ISO 9001:2015 shall continually improve the suitability, adequacy and effectiveness of its quality management system. It requires the organisation to consider the results of analysis and evaluation and the outputs from management review, to determine if there are needs or opportunities that shall be addressed as part of its continual improvement journey. For conducting effective management reviews, it prescribes reviewing information on the performance and effectiveness of the quality management system, including trends in seven parameters. These seven parameters include: customer satisfaction and feedback from
relevant interested parties; the extent to which quality objectives have been met; process performance and conformity of products and services; nonconformities and corrective actions; monitoring and measurement results; audit results; the performance of external providers (ISO 9001, 2015).

IATF 16949:2016, on the other hand, specifies additional requirements related to continual improvement and specifies that the organisation shall have a documented process for continual improvement covering identification of methodology, effectiveness monitoring system, related risk analysis and an action plan for improvement (IATF, 2016).

The current versions of both ISO 9001 and IATF 16949 standards (i.e. ISO 9001:2015 and IATF 16949:2016) require continual improvement in customer satisfaction as well as in system performance. System performance and compliance is assessed by the number of non-conformities reported during audits of these standards (Chumba et al., 2019; Laskurain-Iturbe et al., 2021).

Antithetical views about the role of ISO 9001 and IATF 16949 in ensuring continual improvement of customer satisfaction and system performance are noticeable. Psomas (2013) demonstrated that ISO 9001 leads to continual improvement in customer satisfaction and non-conformity prevention in the service sector firms. Arumugam et al. (2008) had similar observations from a study on Malaysian firms. Usman et al. (2019) revealed that ISO 9001 adoption increases customer satisfaction for both local and global customers. Sá et al. (2019) reported that continual improvement in customer satisfaction is a major contribution of ISO 9001. Using a 5-point Likert scale, where 5 was most important, they received a response rating of 4.06 for its contribution in organisational improvement. Rather than researching organisations who implemented ISO 9001 system, Domingues et al. (2019) captured views of the certification body’s auditors about ISO 9001 system and reported that continual improvement received average rating of 3.28 on 5-point scale where 5 was highest possible rating. Moreover, this was the highest rated factor about the role of ISO 9001 in improvement.

Terziovski et al. (2003) concluded that ISO 9001 fascinates managers to adopt it and this self-motivated adoption leads to better organisational performance.

Franceschini et al. (2011) reported continual improvement in customer satisfaction under automotive quality system standard ISO/TS 16949 (predecessor of IATF 16949). Chumba et al. (2019) concluded that ISO 9001 significantly reduces the number of non-conformities present in the system. Allur et al. (2014) surveyed 110 Spanish firms in 1999 and then again in 2011 for a longitudinal study. They observed that the average customer satisfaction level in these firms changed from 3.54 to 3.56, measured using the 5-point Likert scale. For non-conformities, the average number of non-conformities declined from 3.21 to 3.01.

Contradictory findings are also widely reported. Lahidji and Tucker (2016) did a study of 100 quality professionals. They observed that although continual improvement is essential in ISO 9001 and ISO/TS 16949 (predecessor of IATF 16949), its absence rarely leads to disqualification from certification. Disagreement was evident among interviewed professionals if certified organisations are actually doing continual improvement. Most organisations were reportedly not able to operationalise and sustain it. Major reasons for these problems were lack of resources and focusing on achieving certification than on real improvements. They opined that organisations take-up simple continual improvement projects to pass certification audits and leave major but real problems as-it-is. Laskurain-Iturbe et al. (2021) interviewed 8 certified organisation’s representatives and 10 professionals (auditors/consultants). They concluded that IATF 16949 intensifies ISO 9001 goals of improving performance and customer satisfaction. They also found that IATF is more aligned towards customer requirements than ISO 9001. Automotive OEMs (original equipment manufacturers, in this case vehicle manufacturers) believed that most problems belong to Tier-1 and Tier-2 organisations in their supply chain. Auditors and consultants believed that ISO 9001 audits are shorter and less strict than automotive IATF 16949 audits.
Therefore, they reveal lesser non-conformities. Chiarini et al. (2020) also argued that ISO 9001 is not as effective as it should be in ensuring day-to-day improvements and problem-solving, which are essential for continual improvement. Fonseca and Domingues (2018) surveyed 309 ISO 9001 certified organisations and found that continual improvement is not extensively used.

Some mixed views also emerged in earlier research. Zimon and Dellana (2020) did a longitudinal study of 22 ISO 9001 certified small and medium firms that eventually discontinued ISO 9001 certification. 22% of the delisted firms were happy with their decision but 53% regretted it because ISO 9001 was helpful in improvements. Similar findings were presented by Cândido et al. (2021) in research that proved that when ISO 9001 certifications are discontinued, the economic performance of the firms is not adversely affected. Sun et al. (2019) also recognised that there are gaps in the effectiveness targets of ISO 9001 certified firms, and they specified their causal relationships with different organisational and contextual factors.

Astrini (2021) revealed how different research methods result in different outcomes. 77% of previous longitudinal studies did not find a relationship between ISO 9001 and performance improvement but other individual studies found positive relationships. Astrini (2021) also pointed out that this comparison is based on scant studies, and further research is needed in this direction. He concluded that even after 30 years of research, there are no signs of convergence of opinion about the role of quality management systems in improving organisational performance.

3. Research gaps and research approach

The literature reviews clearly establish following gaps:

1. There is scarcity of longitudinal research about ISO 9001 and IATF 16949 standards (Astrini, 2021; Kusumah and Fabianto, 2018; Lo and Yeung, 2018).

2. Research is inconclusive if these standards result in sustained, long-term improvements; especially in customer satisfaction and number of non-conformities (Astrini, 2021; Cândido et al., 2021; Zimon and Dellana, 2020).

3. Earlier research about these two indicators is predominantly based on user ratings, perception ratings, or interviews; and does not reveal the real satisfaction numbers and non-conformities over the long term (Arumugam et al., 2008; Chen and Chang, 2017; Chiarini et al., 2020; Eve and Sprimont, 2016; Psomas, 2013; Zayas-Mateo and Martínez-Lorente, 2021).

From the recommended parameters that require analysis and evaluation from a continual improvement perspective in ISO 9001:2015 and IATF 16949:2016, two parameters in this study are chosen for study; these are customer satisfaction and the number of non-conformities reported during system audits by the certification agencies. These two are the summum-bonum of any quality system and the ultimate indicators of system performance that encapsulate all systemic changes such as rejections, delivery performance, cost leadership etc.

The standards require information on three types of non-conformities (ISO 9001, 2015; IATF 16949, 2016). Product non-conformities (e.g. product rejections), process non-conformities (e.g. using a deviated process parameter/condition from the specified process parameter/condition) and system non-conformities (deficiencies of the quality management systems as revealed during periodic system audits). The product and process non-conformities may go up and down depending on several factors, such as introducing a new product/process, changes in the system/sub-systems, revised engineering specifications,
revised customer drawings, revised tolerances and so on. Product non-conformities can have huge variances depending on the process accuracy level. It can vary from 690,000 defects per million opportunities (at the one-sigma level) to 3.4 defects per million opportunities (at the six-sigma level) on the six-sigma performance scale (Patel and Chudgar, 2020). System non-conformities do not have such a huge variance. The trend of system non-conformities will remain relatively stable because the system requirements are not changing unless the standard itself changes. In a study of ISO 9001 certified firms across different sectors, it has been observed that the average number of system non-conformities ranges from zero to eleven (Sampio et al., 2010). Another study on the ISO 9001, IATF 16949, ISO 14001, ISO 45001 and AS 9100 standards concluded that the average number of system non-conformities during an audit ranges from four to six [3]. Therefore, studying the trend of system non-conformities is good for time series comparison.

Similarly, customer satisfaction is a macro-level indicator and may not change significantly due to minor changes in the system, such as the introduction of a new process. Moreover, customer satisfaction is one of the most important indicators of business performance (Yadav and Al Owad, 2022; Yadav et al., 2020) and it can be easily compared among different organisations even when the measurement scales are different (Yadav et al., 2023).

### 3.1 Research approach

To explore these gaps, six certified organisations are selected which are certified for 10 or more years and are willing to share their satisfaction scores and the number of non-conformities reported by their certification agencies during quality management system audits. Details of these organisations are presented in Table 1. For confidentiality, the names of organisations are not revealed and a code is assigned to each organisation.

In Table 1, the customer satisfaction data of a year represent the average satisfaction percentage for that organisation in that particular year. Different organisations use different parameters, e.g. quality, delivery etc. to evaluate customer satisfaction. The purpose of analysis here is not to compare the satisfaction score of one organisation with others but to analyse the trend of satisfaction score for the same organisation over a ten years period. Therefore, even if the satisfaction measurement method of each organisation is different, it will not be problematic for our analysis. The number of non-conformities represent the non-conformities reported by certification agencies during annual audits against ISO 9001 and IATF 16949 standards.

After analysing the data of six participating organisations, the secondary data of seventeen automotive vehicle manufacturers is analysed. It includes data from the Big-Three (three automotive vehicle manufacturers, i.e. General Motors, Ford and Chrysler; who initiated automotive quality system standards). These data are available on ACSI (American Customer Satisfaction Index) for each year from 2011 to 2020.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>G-2</td>
<td>9001:2015</td>
<td>(Manufacturing)</td>
<td>India</td>
<td>No</td>
<td>Change of version from ISO/TS 16949 to IATF 16949</td>
</tr>
<tr>
<td>3</td>
<td>G-3</td>
<td></td>
<td>India</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>A-1</td>
<td>IATF</td>
<td>Automotive</td>
<td>India</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>A-2</td>
<td>16949:2016</td>
<td></td>
<td>India</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>A-3</td>
<td></td>
<td></td>
<td>India</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

Table 1. Details of organisations studied during the period 2011–2020

Source(s): Data compiled by authors
Customer Satisfaction Index) Website [2]. Although these data pertain to the United States customers only, the trends of customer satisfaction can still be analysed to understand changes in satisfaction score, i.e. whether staircase type improvement (stable but going up) is visible as required in both standards or it follows a different pattern.

Thus, a combined sample of 23 organisations, including the primary data from six organisations and the secondary data from seventeen organisations, is evaluated. Research on quality management system performance using same six numbers of organisations is previously available (Sweis et al., 2022). Castka (2018), for a study of ISO 9001 certified firms, used a sample size of 15. This study claims that 4 to 10 cases are adequate to examine a research issue. Kusumah and Fabianto (2018) used a sample of 27 firms to study the performance of ISO 9001 certified firms in Indonesia. Esgarrancho and Cândido (2020) used a sample size of 29 ISO 9001 certified firms for their research. Sample size used by Zimon and Dellana (2020) for the longitudinal study of ISO 9001 certified units was 22. Opinion based research on the effectiveness of ISO 9001 certified firms by Laskurain-Iturbe et al. (2021) involved 8 certified organisations’ representatives and 10 quality professionals, i.e. 18 individuals. That way, the sample size used in this study is quite similar. Moreover, it must be noted that during the audit of a quality management system standard such as ISO 9001 or IATF 16949, auditing agencies make decisions about improvements in a performance metric by comparing the performance of the current period with that of the last audit. It often results in a comparison of only two data values. Neither ISO 9001 nor IATF 16949 have any clause or requirement that mandates determining an adequate sample size for performance comparison. Both standards’ certification cycles are also only three years long. Therefore, most organisations end up comparing only three data points to determine if they are continually improving or not.

The auditing rules and clause requirements of both ISO 9001 and IATF 16949 standards are applicable equally to all organisations. Therefore, decisions about certifying, not certifying, or continuing the certification of a firm cannot be taken by observing a particular data pattern in a significantly large number of organisations. The decisions are taken for every individual organisation, with no exceptions to the rules. Hence, if a sample of six or even a smaller number of organisations is showing a trend that is not in accordance with the rules of the quality system standards, it should not be ignored on the pretext that it is a small sample requiring no attention.

4. Data and analysis
The data compiled of six organisations is presented in Table 2 and Table 3. Table 2 contains average customer satisfaction percentage data, and Table 3 contains data about the number of non-conformities in these organisations reported during annual audits performed by certification agencies.

4.1 Data analysis
The data for customer satisfaction (Table 2) and number of reported system non-conformities (Table 3) both show irregular patterns of improvement. Some cycles of improvement are visible during short periods but the overall ten years trend hovers around similar levels without any visible signs of improvement. It is also notable that during this 10 years period, none of the organisations lost its certified status. One possible reason behind this phenomenon is that both standards allow organisations to analyse weaknesses using root-cause analysis and corrective-actions. When the trends show signs of improvement, no action is required. When the trend starts showing deteriorating performance, organisations come up with root-cause analysis and action plans to improve the situation, which temporarily
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>G-1</td>
<td>95</td>
<td>86</td>
<td>94</td>
<td>88</td>
<td>99</td>
<td>87</td>
<td>87</td>
<td>98</td>
<td>91</td>
<td>95</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>Wave</td>
</tr>
<tr>
<td>Trend</td>
<td>Base</td>
<td>Down</td>
<td>Up</td>
<td>Down</td>
<td>Up</td>
<td>Continually Improving</td>
<td>Down</td>
<td>Up</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G-2</td>
<td>93</td>
<td>99</td>
<td>87</td>
<td>89</td>
<td>98</td>
<td>99</td>
<td>96</td>
<td>99</td>
<td>99</td>
<td>88</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>Wave</td>
</tr>
<tr>
<td>Trend</td>
<td>Base</td>
<td>Up</td>
<td>Continually Improving</td>
<td>Down</td>
<td>Up</td>
<td></td>
<td>Up</td>
<td>Down</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G-3</td>
<td>92</td>
<td>91</td>
<td>91</td>
<td>86</td>
<td>88</td>
<td>89</td>
<td>89</td>
<td>94</td>
<td>96</td>
<td>96</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>Wave</td>
</tr>
<tr>
<td>Trend</td>
<td>Base</td>
<td>Down</td>
<td>Same</td>
<td>Continually Improving</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-1</td>
<td>96</td>
<td>86</td>
<td>95</td>
<td>89</td>
<td>87</td>
<td>92</td>
<td>95</td>
<td>94</td>
<td>86</td>
<td>93</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>Wave</td>
</tr>
<tr>
<td>Trend</td>
<td>Base</td>
<td>Down</td>
<td>Up</td>
<td>Down</td>
<td>Continually Improving</td>
<td>Down</td>
<td>Down</td>
<td>Up</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-2</td>
<td>94</td>
<td>95</td>
<td>91</td>
<td>93</td>
<td>90</td>
<td>88</td>
<td>91</td>
<td>92</td>
<td>93</td>
<td>96</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>Wave</td>
</tr>
<tr>
<td>Trend</td>
<td>Base</td>
<td>Up</td>
<td>Down</td>
<td>Up</td>
<td>Down</td>
<td>Continually Improving</td>
<td>Down</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-3</td>
<td>87</td>
<td>98</td>
<td>85</td>
<td>95</td>
<td>93</td>
<td>90</td>
<td>90</td>
<td>92</td>
<td>99</td>
<td>93</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>Wave</td>
</tr>
<tr>
<td>Trend</td>
<td>Base</td>
<td>Up</td>
<td>Down</td>
<td>Up</td>
<td>Down</td>
<td>Continually Improving</td>
<td>Down</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note(s):** To Table 2
1. X: 3 points consistently stable or improving. Y: 4 points consistently stable or improving. Z: 5 or more points consistently stable or improving. Base refers to the first data of the study period
2. Pattern: Staircase (stable and gradually increasing); Ocean Wave (irregular up and down); Other
3. G-1, G-2, G-3 are ISO 9001 certified and A-1, A-2, A-3 are IATF 16949 certified organisations

**Source(s):** Data compiled by authors
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>G-1</td>
<td>1</td>
<td>5</td>
<td>2</td>
<td>5</td>
<td>0</td>
<td>2</td>
<td>5</td>
<td>1</td>
<td>6</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>Wave</td>
</tr>
<tr>
<td>Trend</td>
<td>Base</td>
<td>Up</td>
<td>Down</td>
<td>Up</td>
<td>Down</td>
<td>Up</td>
<td>Down</td>
<td>Up</td>
<td>Down</td>
<td>Wave</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G-2</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>0</td>
<td>5</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>Wave</td>
</tr>
<tr>
<td>Trend</td>
<td>Base</td>
<td>Same</td>
<td>Continually Improving</td>
<td>Continually Improving</td>
<td>Continually Improving</td>
<td>Up</td>
<td>Up</td>
<td>Up</td>
<td>Up</td>
<td>Wave</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G-3</td>
<td>4</td>
<td>5</td>
<td>1</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>Wave</td>
</tr>
<tr>
<td>Trend</td>
<td>Base</td>
<td>Up</td>
<td>Down</td>
<td>Up</td>
<td>Continually Improving</td>
<td>Continually Improving</td>
<td>Up</td>
<td>Up</td>
<td>Up</td>
<td>Wave</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-1</td>
<td>9</td>
<td>9</td>
<td>1</td>
<td>8</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>3</td>
<td>10</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>Wave</td>
</tr>
<tr>
<td>Trend</td>
<td>Continually Improving</td>
<td>Continually Improving</td>
<td>Up</td>
<td>Down</td>
<td>Up</td>
<td>Down</td>
<td>Down</td>
<td>Up</td>
<td>Down</td>
<td>Wave</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-2</td>
<td>10</td>
<td>6</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>5</td>
<td>10</td>
<td>3</td>
<td>8</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>Wave</td>
</tr>
<tr>
<td>Trend</td>
<td>Continually Improving</td>
<td>Continually Improving</td>
<td>Up</td>
<td>Up</td>
<td>Down</td>
<td>Up</td>
<td>Down</td>
<td>Down</td>
<td>Wave</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-3</td>
<td>5</td>
<td>6</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>7</td>
<td>7</td>
<td>9</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>Wave</td>
</tr>
<tr>
<td>Trend</td>
<td>Base</td>
<td>Up</td>
<td>Down</td>
<td>Up</td>
<td>Down</td>
<td>Up</td>
<td>Down</td>
<td>Same</td>
<td>Continually Improving</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note(s):** To Table 3
1. X: 3 points consistently stable or improving. Y: 4 points consistently stable or improving. Z: 5 or more points consistently stable or improving. Base refers to the first data of the study period
2. Pattern: Staircase (stable and gradually increasing); Ocean Wave (irregular up and down); Other
3. G-1, G-2, G-3 are ISO 9001 certified and A-1, A-2, A-3 are IATF 16949 certified organisations

**Source(s):** Data compiled by authors
provides relief, at-least during external audits. Often occasional improvement is also demonstrated by organisations.

Another reason behind continuation of this situation is the way the data is presented and analysed. Annual customer satisfaction data often consists of multiple customers and multiple parameters. Organisations mould these data according to their convenience. For instance, if customer satisfaction is lowered in a particular data collection cycle due to poor feedback by a specific customer, action plans are prepared for that particular customer. Frequent follow-up and persuasion lead to improved rating from that customer in the next cycle, while the overall situation remains the same. This lack of seriousness, beating around the bush approach and losing focus on real issues as highlighted by Lahidji and Tucker (2016), results in ocean wave type fluctuations in performance rather than expected staircase shaped improvements.

Requirement of significant efforts and substantial cost in ensuring real and long-term improvements, often acts as a deterrent for organisations as indicated by Nikolay (2016). Organisations do not realise that a small investment in analysis and prevention of adverse outcomes will eventually save them significantly in terms of failure costs. Many organisations execute processes and quality systems separately, i.e. in a disconnected manner. They do not use quality systems as an integral part of business to improve processes, but to get certifications and meet contractual requirements. As a result, they have to spend additional time on quality systems which they find burdensome (Zimon and Dellana, 2020). Table 3 shows that the number of non-conformities is higher in IATF 16949 certified organisations than in ISO 9001 certified organisations. This is in line with the findings of Laskurain-Iturbe et al. (2021). However, their claim that IATF 16949 brings more seriousness towards improvement than ISO 9001 is not justified from the findings presented in Table 2 and Table 3.

To cross check these findings, publicly available data of customer satisfaction is also analysed. American Customer Satisfaction Index (ACSI) provides year wise customer satisfaction data of various organisations. The data about customer satisfaction in the United States of Big Three (General Motors, Ford and Chrysler), and other auto-makers is available on its website [2]. Long term trend of these data also shows random up and down movement with no signs of continual improvement. Using the same study period, as used in this study, i.e. 2011–2020, change in customer satisfaction of major automobile manufacturers is compared using this database in Table 4.

Through this database, attempts are made to find 3/4/5 or more points with consistently stable or improving trends as explored in the longitudinal study of six certified organisations. The data presented in Table 4 shows 0 such points for Ford, 0 for the GMC model of General Motors, 0 for the Cadillac model of GM, 0 for the Buick model of GM, 1 for the Chevrolet model of GM and 1 for Chrysler (Stellantis). Other than the Big-Three, Mercedes-Benz shows 0, Honda 0, Volkswagen 1 and BMW 0 instances of stable or improving numbers in a 10 years cycle.

The customer satisfaction numbers for these top automobile manufacturers show a regularly fluctuating up and down pattern with no consistency in improvement. This secondary database pattern of top-notch manufacturers from the United States is similar to organisations whose data pattern was analysed in Table 2 and Table 3. All organisations reflect ocean wave shaped irregular up down patterns rather than step wise improvement expected in quality management system standards.

These revelations are in contrast with the opinion of OEMs revealed by Laskurain-Iturbe et al. (2021) that most problems belong to Tier-1 and Tier-2 organisations in the automotive supply chain. Lo et al. (2013) had also suggested that the ISO 9001 performance may depend on the position of the certified organisation in the supply chain, and it is a matter for further research. In this research, it is observed that both OEMs (covered through a
secondary data source) and their suppliers (covered through the primary data source) are failing to achieve the expected patterns of continual improvement in customer satisfaction. Each organisation shows random up and down patterns like ocean waves and not even one organisation demonstrates staircase style improvement in customer satisfaction. The same can be said about the number of non-conformities also. Although for this category, no secondary data is available; the primary data reflects that the trend of non-conformities is no different from customer satisfaction trend.

5. Discussion and implications of findings, limitations and future research directions

The longitudinal study using primary and secondary data reveals following fallacy about continual improvement:

(1) Both ISO 9001 and IATF 16949 quality management systems require continual improvement. However, in the certified organisations, the long-term trend of customer satisfaction and the number of non-conformities; which are the two required indicators of organisational performance, fail to demonstrate continual improvement.

(2) Occasional short cycles of improvement are seen in these indicators but they do not follow the much-hyped staircase model i.e. stability followed by improved performance. In fact, the pattern resembles ocean waves that have frequent up and down movements with no consistency.
(3) The ocean wave style up and down system performance is not limited to either ISO 9001 or IATF 16949 standards, or a particular organisation, or position of that organisation in its supply chain. The trend of primary data shows it is common in all organisations studied and both standards. The trend of secondary data shows it is prevalent even in many automotive OEMs.

(4) Organisations do not lose certification when long-term continual improvement is not evident, even though continual improvement is a mandatory requirement in both ISO 9001 and IATF 16949 standards. This aspect was also revealed in previous research on the ISO 9001 standard using various parameters, such as financial performance, which is not mandatory to be monitored and achieved in ISO 9001 (Cândido et al., 2021; Kusumah and Fabianto, 2018; Lo and Yeung, 2018).

(5) Both standards are muted on the sample size required and the methodology to determine if the change in performance metrics, especially those related to customer satisfaction and system non-conformities is really an improvement or just a difference in value arising from the changed data sample. It allows organisations to choose which customers to sample in order to manage their continuous improvement target without bringing up actual improvements.

(6) Both standards prescribe requirements and rules for a certification cycle of three years. In many organizations, some performance metrics are measured or obtained on an annual basis, e.g. external customer satisfaction scores, annual external audit non-conformities, etc. The organisations and their certification agencies in this situation have only three data points available for comparison, which may be an insufficient sample size to determine if improvement (or any change) is statistically significant. While simple data point comparisons may be permitted for newly certified organizations, those that have been certified for a longer period of time may be asked to provide evidence of long-term improvement. It will also be appropriate for both standards to define the minimum period that can be considered long-term.

A priori, the time series statistics of changes in customer satisfaction and system nonconformities over time in ISO 9001 and IATF 16949-certified organisations should follow a step-by-step continual improvement pattern. However, neither metric’s actual pattern is either stepwise or continuously improving. The data pattern belies a staircase-style continual improvement pattern and hovers around the same level with erratic up and down movements resembling ocean waves. The praxes of ISO 9001 and IATF 16949 quality systems seem inappropriate to guarantee regular and assured improvement in the performance of certified entities, at least when customer satisfaction and system nonconformities are analysed. It also establishes the need for better standard governance by certification agencies and standard development bodies, as recommended by Cândido et al. (2021). It can be done by including in the standards a well-defined requirement of long-term continual improvement evidence rather than a simple two- or three-year raw number comparison.

These findings have a variety of implications. On the theoretical front, it posits an interesting challenge of defining the period that can be termed long-term. After all, achieving never-ending improvement over an indefinite period is impossible to achieve. If no performance metric deteriorates ever, be it customer satisfaction, supplier ratings, rejections, the cost of poor quality, non-conformities, or something else, soon it will hit its maximum possible limit. For example, if an organisation has only a few reported nonconformities during the audits, will it be possible to bring these down to zero? Even if zero non-conformities are achieved in one or a few audits, can they remain zero forever? Similarly, if the initial customer satisfaction level of an organisation is 80% or 90%, with the staircase type of
continual improvement, can one expect it to never come down, reach 100% and remain there forever? It will be quite unrealistic to assume so. If no organisation (as evident from primary and secondary dataset) can sustain continual improvement in the long-term, we need to think about the rationale of keeping continual improvement requirements in quality management standards without any clarity about length over which it should be demonstrated. Theorists shall also define how much variation or dip from previous performance level is indicative of reversal of improvement and how much dip can be allowed. The findings also reveal the requirement of elaboration on tools and methods to ensure continual improvement in a fail-proof manner. The need to re-evaluate the role of Kaizen and breakthroughs in continual improvement is also to be highlighted. It is also an important fact that the effort required by an organisation in the present time to secure 95% customer satisfaction is much higher than the effort required by the same organisation to achieve the same level 10 or 20 years ago. Increased competition and enhanced customer expectations make it more challenging for any organisation to sustain similar performance levels. It is very much possible that a lower customer satisfaction level, e.g. 88% of current period signifies better organisational performance than a slightly higher satisfaction score, e.g. 90% achieved by that organisation several years ago. Agencies that develop quality management standards and agencies that audit or monitor organisational performance shall keep this aspect also into mind. Guidelines can be developed by such agencies to evaluate performance metrics in the long term similar to the manner in which we evaluate time value of money.

Organisations implementing quality management standards shall understand that without serious efforts they cannot achieve long-term improvement. Any trick to demonstrate improvement over the previous period to attain certification will eventually backfire. It is an uphill task to secure customer satisfaction with improving levels on a long-term basis. Effective root-cause analysis, poka-yoke (mistake-proofing), use of concepts like NOAC (next operation as customer), detail-oriented thinking, team work, focus on defect prevention and customer orientation is required to make long term continual improvement a reality. The practicing managers shall ensure that they are not running two decoupled systems, one for quality management standards and other for their own. Quality management practices shall be fundamental and integral part of the management system to ensure sustained continual improvement. Only when all components of the system will work with an altruistic mindset to make customers (external or internal) happy, the real improvements will begin that will sustain forever.

The certification agencies of these standards also need to be more vigilant and need to deploy trained and experienced auditors who can see through the barrage of data to identify improvement opportunities. It is not sufficient to deploy auditors who barely fulfil auditor qualifications. The quality of auditing, non-conformities discovered, and eventually customer satisfaction will directly depend on the quality of auditors deployed.

The most crucial implications of this study are for the standard development agencies such as ISO (international organisation for standardisation) and IATF (international automotive task force). These agencies need to bring additional clarity in their standards about long-term continual improvement. A new sub-clause in continual improvement requirements can be added that demands evidence of long-term improvement and related data analysis. The sampling criteria for satisfaction measurement also require elaboration because currently there is no stipulated requirement about the number of samples to be collected for monitoring and measuring customer satisfaction. The current practice is to report raw numbers (as shown in Table 2 and Table 3) of a performance metric such as customer satisfaction, number of non-conformities etc. without adding any information about its average, variance, data distribution etc. The certification agencies also do not demand this information from the organisations during their audits because it is not provisioned in quality system standards. Standard development agencies shall introduce a requirement for
organisations to statistically compare current performance with past performance. Simply stating that customer satisfaction of an organisation was 87% last year and 88% this year shall not necessarily be considered improvement. Statistically, these average satisfaction levels may not be different. It applies to all performance comparisons and not just customer satisfaction. The standard developing agencies can incorporate these requirements in the next revision of these standards, which are already underway and are likely to be released within the next few years. If organisations, certification agencies and standard development agencies pay attention to this fallacy, possible abandonment of certifications as highlighted in previous research can be prevented or reduced (Cândido and Ferreira, 2022, 2023; Chiarini, 2019; Ferreira and Cândido, 2021; Simon and Kafel, 2018).

5.1 Limitations and future research directions
The study is based on a small sample size because finding organisations that have been using a standard for a fairly long time is difficult. Although many organisations exist that have been certified for a very long time, some organisations neither maintain data for prolonged periods because it is not mandated by standards, nor are they willing to share it even when it is available. Often, organisations change or add certificates as well, e.g. ISO 14001 and ISO 45001 are added to ISO 9001 certification for integrated management system (IMS). In such situations, segregating non-conformity data for a particular system becomes difficult. Many clauses are common in ISO 9001, IATF 16949, ISO 14001 and ISO 45001, which together form IMS. For example, document control, training, internal audit and management reviews are some of the common clauses. Most organisations prepare common formats, procedures, etc. for these clauses. When a non-conformity is issued against such clauses, it becomes almost impossible to pinpoint the standard (or the system category, i.e. quality, environment, health and safety) that contributed to it. Kusumah and Fabianto (2018) also indicated that segregating firm performance becomes challenging when multiple standards are implemented together.

Although this small sample size was compensated with additional secondary data, it is possible to increase and diversify the sample. Organisations of other types, other locations can be added. Other standards can also be investigated. The length of period studied can also be altered for further longitudinal research. The data analysed can be broken either into different cycles, e.g. monthly/quarterly, or into other categories, e.g. quality related satisfaction, delivery related satisfaction, packaging related satisfaction etc. For non-conformities reported through quality management system audits, data available with certification agencies can be analysed. Non-conformity data from internal audits, process audits, product audits can also be taken-up for further research. Organisation specific, business sector specific, and ISO standard specific continual improvement studies can also be planned, taking into consideration the parameters of that particular organisation, sector, or standard. It is noteworthy that many organisations and many certification agencies perform quality system audits not as rigorously and authentically as required by the standards. It specially happens when the aim of the audit becomes certification rather than quality and system improvement (Yadav et al., 2022). In such cases, analysing the number or trend of system non-conformities becomes meaningless and such organisations should be excluded from future studies.

The performance of ISO 9001 certified organisations can be influenced by many factors. These factors may include the preparedness of organisations towards quality systems (Esgarrancho and Cândido, 2020); the internalisation of quality system practises (Tarí et al., 2019); and many other contextual factors such as management commitment, organisational culture, etc (Lo et al., 2013). In this study, the possible influence of such factors on continual improvement is not evaluated. Further research can be planned to ascertain that when these
factors are conducive, i.e. when an organisation is well prepared for quality certification, its management is committed, the internalisation of quality systems is strong, etc., in that situation, does continual improvement show an ocean wave pattern or does it achieve the expected staircase-styled continual improvement?

It is notable that this study does not aim to prove that continual improvement can never become a reality because all the entities studied failed to do so. It is still a small sample that should not be generalised; however, it certainly points out fallacies in both ISO 9001 and IATF 16949 standards about staircase-styled continual improvement patterns in certified entities.

Notes

References


About the authors
Neeraj Yadav is the director and principal consultant at Qualicon Consultancy Co., India. He obtained his PhD from the Indian Institute of Technology Delhi. He has around 25 years of management consultancy experience and is a certified Six Sigma Master Black Belt; certified Lean Management professional; certified Lead Auditor of ISO 9001, ISO 14001, ISO 45001 management systems; and a certified internal auditor of IATF 16949 automotive quality and ISO/TS 22163 (IRIS) railway quality management systems. He has provided services to over 1,000 organisations, ranging from Fortune 500 companies to small enterprises, on different management system standards. Neeraj Yadav is the corresponding author and can be contacted at: ny.iitd@gmail.com

Pantri Heriyati is Associate Professor at Binus Business School, Indonesia. She manages the doctor of research programme in management at Binus Business School. She has a PhD in Management from University of Indonesia and Master of Commerce from Wollongong University, Australia. She has published four books and many research papers. In addition, she has also worked as a business and productivity consultant.

For instructions on how to order reprints of this article, please visit our website:
www.emeraldgrouppublishing.com/licensing/reprints.htm
Or contact us for further details: permissions@emeraldinsight.com