**Supplementary file: Instruments and frameworks for the assessment of improvement capability**

| **Lead author** | **Method** | **Sector** | **Country** | **Final sample size** | **Response rate** | **Number of areas of interest** | **Summary** | **Reliability (Cronbach's alpha)** | **Validity tests** | **Improvement capability group** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [Adam et al. [1](#_ENREF_1)] | Survey | Manufacturing | Firms in 9 countries worldwide | 977 | Unstated | 9 factors  | Survey of multiple global manufacturing companies’ improvement practices to identify key factors and to assess geographical variation. Found that whilst quality improvement predicts quality performance in any region. Quality improvement practices alone are insufficient to change financial performance. | 0.74-0.89 | Not reported | Improvement models |
| [Adam [2](#_ENREF_2)] | Survey | Manufacturing | USA  | 187 | 46% | 20 items | Factors were identified to identify quality and productivity improvement approaches and indicates that the improvement approach may depend on which measures are selected for quality and financial performance. | Not reported | Yes | Improvement models |
| [Adebanjo, Kehoe [3](#_ENREF_3)] | Survey and interviews | Manufacturing | UK | 166 | 25% | 7 areas  | Survey and interviews showed that teamwork as least developed across organisations regardless if a Total Quality Management (TQM) programme was in train. Main observations indicated that organisations lacking a comprehensive and structured approach to quality development were more likely to have inconsistent success with culture change. | Not reported | Not reported | Improvement models |
| [Ahire et al. [4](#_ENREF_4)] | Survey | Automotive | USA | 371 | 37% | 12 constructs | Identifies 12 constructs for integrated quality management (QM) strategy and tests developed scale in one industry. Concluded that quality management strategies act in synergy and influence each other to different degrees, pointing to inter-related determinants of QM. Suggests further studies needed to assess the extent of TQM implementation. | >0.6 | Yes | Improvement models |
| [Anand et al. [5](#_ENREF_5)] | Case study and interviews | Manufacturing and Healthcare | USA | 5 cases | Not applicable (n/a)  | 8 constructs | Development framework through grounded theory for continuous improvement infrastructure based on dynamic capabilities. Developed with five USA firms. | Not reported | Not reported | Improvement models |
| [Anderson et al. [6](#_ENREF_6)] | Survey | Electronics, Machinery and Transportation | USA | 41 | 60% | 7 constructs | Describes quality management and tests theory based on Deming's 14 points using seven constructs based on Delphi survey. Indicates through path analysis that there are large unexplained effects suggesting the theory is not exhaustive. | 0.6 | Indicated | Improvement models |
| [Baidoun [7](#_ENREF_7)] | Survey | Small ISO 9000 Industry and Service  | Palestine | 78 | 100% | 19 factors | Identifies important quality management factors from the literature develops instrument and tests and indicates that these are relevant in the Palestinian context.  | Consensus approach | Consensus approach | Improvement models |
| [Batalden, Stoltz [8](#_ENREF_8)] | Case studies | Hospital | USA | n/a | n/a | 4 themes | Case study example to demonstrate developed framework.  | Not reported | Not reported | Improvement models |
| [Benn et al. [9](#_ENREF_9)] | Survey | Hospital | UK | 284 (19 organisations) | 52% | 22 factors | Development of a survey to predict changes in safety climate and capability as part of the UK safer patients’ initiative. Suggests that scores did improve, over one year, but that context and hospital size and type were not significant factors.  | 0.952 | Not reported | Change models |
| [Benson et al. [10](#_ENREF_10)] | Survey | Manufacturing and service | USA | 152 (20 organisations) | unstated | 8 critical factors | Merges 2 existing instruments linked to quality management and organisational quality context, and indicates that context moderates the effectiveness of quality management. Most significant factor is identified as management knowledge, accounting for 40% of the variance, in the service sub sample only internal factors correlated with quality management.  | 0.7-0.9 | Yes | Improvement models |
| [Berlowitz et al. [11](#_ENREF_11)] | Survey | Nursing homes | USA | 1065 (35 organisations) | 60% | 42 items | Examined quality improvement implementation within USA nursing homes and culture and results were impacted. Focused on pressure ulcer care and found that there was significant variation of quality improvement implementation and this was not linked to size, status or location. However, it also found that organisations with a developmental culture were more advanced in implementing improvement practices and that there were indications that this linked to improved results. | 0.89 - 0.92 | Not reported | Change models |
| [Bessant, Francis [12](#_ENREF_12)] | Assessment framework | Manufacturing and Financial Services | UK | 3 | n/a | 6 levels | A 6-level scale is described ranging from 0 -5 describing differing levels of strategic improvement capability implementation from none to fully embedded. Indicates that both incremental and disruptive improvement needed and should link into organisational strategic goals and measures. Designed to be used as an assessment tool. | Consensus approach | Consensus approach | Maturity models |
| [Black, Porter [13](#_ENREF_13)] | Survey | EFQM members | Europe | 204 | 44% | 10 factors | An empirical framework for designed to identify critical total quality management factors using experience of practitioners and Baldrige Award. Study offered a simple, reliable and valid approach for examine TQM practices and systems which can be used to improve quality award criteria and other similar self-assessments. | >0.6 | Yes | Improvement models |
| [Bobiak et al. [14](#_ENREF_14)] | Interviews and observation | Primary Healthcare | USA (Ohio) | 15 practices | n/a | 25 items | Suggests that 'capacity for change' or the 'ability and willingness to undertake change' is an organisational characteristic for healthcare quality improvement and describes measurement approach designed and tested within healthcare to support capacity building. | 0.94 | Yes | Change models |
| [Bou-Llusar et al. [15](#_ENREF_15)] | Questionnaire | Manufacturing and Service | Spain | 446 | Not stated | 13 constructs | Review of total quality management instruments to empirically test EFQM (European Foundation for Quality management) frameworks. Suggests that ‘enabler excellence' is key and the study found strong evidence of a causal relationship between enablers and results when TQM is implemented and systematically and with a firm commitment to TQM principles. | >0.7 excl. 1 | Yes | Improvement models |
| [Software Engineering Institute [16](#_ENREF_16)] | On site observation | Unstated | NA | n/a | n/a | n/a | A framework to examine for five levels within practices, from fully implemented to not yet for each process. This is aggregated into goal satisfaction and organisational ratings. There must be full consensus from the team for the scores given. Areas addressed are not exhaustive and can be tailored as required. | Consensus | Not reported | Maturity models |
| [Claver et al. [17](#_ENREF_17)] | Survey | ISO 9000 companies | Spain | 154 | 76% | 8 factors | A literature review to develop an assessment model using EFQM as starting point. Compares instrument with other models, identifies factors that assess TQM results and validates instrument for use in firms of variable sizes. Indicates this instrument can be used to evaluate TQM programmes. | >0.55 except 5 factors | Yes | Improvement models |
| [Criado, Calvo-Mora [18](#_ENREF_18)] | Survey | ISO 9000 companies | Spain | 103 | 19% | 37 variables | Development of a Reformed Excellence Predictor (REP) based on the critical factors for implementing, developing and improving a quality management system (QMS). Found that experience of QMS implementation is a critical factor in achieving results together with management commitment. | Indicated | Yes | Improvement models |
| [Cronemyr, Danielsson [19](#_ENREF_19)] | Maturity model | Manufacturing | Scandinavia | 1 | n/a | 5 levels | A maturity model called Process Management 123, suggests that many improvement programmes fail as organisations try to start advanced work too early and an assessment of maturity would be helpful. 6 assessment levels are proposed and tested across 8 categories. | Not reported | Not reported | Maturity models |
| [Dahlgaard et al. [20](#_ENREF_20)] | Self-assessment | Manufacturing | Denmark | 1 | n/a | 97 statements | A model designed to assess and improve healthcare organisations using a simple methodology based on a simplified excellence model. This can be used for cultural assessment and to identify improvement areas. It is a self-assessment approach encouraging all employees to participate and claims to measure both intangible systemic factors and logical tangible factors.  | Not reported | Not reported | Improvement models |
| [Douglas, Judge [21](#_ENREF_21)] | Survey | Hospitals | USA | 193 | 38% | 7 areas | Study trying to identify if degree of TQM implementation can be measured and how. Clarified the relationship between the degree of implementation of TQM and performance, and thus indicates that for success full adoption of TQM is required. | 0.9 | Yes | Improvement models |
| [European Foundation for Quality Management [22](#_ENREF_22)] | Framework | All | Europe | n/a | n/a | 9 criteria | The EFQM model provides a framework with which to conduct a holistic review of an organisation and its approach to quality management. This model is targeted at European companies. It claims to be able to be used regardless of the improvement methodology utilised in the company and for identifying improvement areas. It aims to promote and recognise sustainable success. | n/a | n/a | Improvement models |
| [Flynn et al. [23](#_ENREF_23)] | Survey | Machinery, transportation and electronics | USA  | 75 | 60% | 7 dimensions | Valid and reliable scales to measure quality management practices were tested in USA manufacturing. The use of such scales is important for organisational self-assessment and can support planning and decision making. The analysis shows that the instrument is a valid predictor or quality performance at plant level. | >0.6 | Yes | Improvement models |
| [Gagliardi et al. [24](#_ENREF_24)] | Survey and interviews | Hospital | Canada | 97 | 79% | 3 themes | A study to evaluate improvement infrastructure as this important for improved outcomes. Found that acute care does not adequately resource quality improvement and investment are needed to develop capacity. | Indicated | Not reported | Change models |
| [Hammer [25](#_ENREF_25)] | Self-assessment | Automotive and chemicals | US | 4 | n/a | 9 constructs | Development of a process and enterprise maturity model to assess process based transformation efforts. Identified two process enablers, which include the abilities of the people who operate the process and enterprise wide capabilities.  | n/a | n/a | Maturity models |
| [Ismail et al. [26](#_ENREF_26)] | Maturity model | ISO 9000 companies | Iran | 8 | n/a | 33 criteria | Paper outlines the development of a self-assessment framework based on 33 criteria linked to ISO 9001 which has been tested in 8 Iranian companies. A radar logic is used as a measurement tool and maturity is also assessed with 8 dimensions.  | 0.933-0.943 | Not reported | Governance models |
| [Ivanovic, Majstorovic [27](#_ENREF_27)] | Survey | Manufacturing | West Balkans | 55 | unstated | 4 levels | Research to identify quality management practices and potential improvement in the Balkans. Identifies four levels of evolution, inspection, quality control, quality assurance and TQM, proposes 5th level of integrated management system. | Not reported | Not reported | Governance models |
| [Jochem et al. [28](#_ENREF_28)] | Maturity model | Small manufacturing enterprises | Germany | 2 | unstated | 7 areas | Paper describing how to measure maturity of knowledge businesses through integration of disciplines such as quality management, process management and knowledge management. | Not reported | Not reported | Maturity models |
| [Joly et al. [29](#_ENREF_29)] | Survey | Public health organisation | USA (16 states) | 1161 | 60% | 4 domains | Describes the development of an instrument to measure quality improvement maturity within public health agencies. Incorporates 10 items that measure skills, functions, and the approach used within organisations. | >0.76 | Yes | Maturity models |
| [Judge, Douglas [30](#_ENREF_30)] | Survey | Manufacturing and service | USA | 3275 (161 organisational units) | Unstated | 8 dimensions | Development of a multi-dimensional scale to measure the construct of 'organisational capacity of change’ (OCC).  | Not Reported | Yes | Change models |
| [Deming Prize Committee [31](#_ENREF_31)] | Framework | All | Japan | n/a | n/a | 6 categories | Set up to promote the teachings of Deming in Japan in 1951. Organisations can apply for the prize and must demonstrate firm commitment to Deming principles and continuous improvement and be open to scrutiny. Most emphasis of the prize is on top management commitment and leadership. | n/a | Not reported | Improvement models |
| [Kaplan et al. [32](#_ENREF_32)] | Cross-sectional survey | Healthcare | USA | 74 improvement projects | 55% | 25 factors | An analysis of the Model for Success in Quality (MUSIQ), looks for relations between different constructs including team quality improvement (QI) skills, and microsystem QI capability. Study showed that microsystem QI capability was one of several factors that had significant effect on QI project performance outcomes, with the most significant being that of QI resourcing. Further information within Kaplan et al. (2012). | >0.8 | Yes | Improvement models |
| [Kianto [33](#_ENREF_33)] | Cross-Sectional survey | Unstated | Unstated | 258 (from 4 organisations) | Unstated | 6 factors | An instrument to measure organisational renewal capability using index called ORCI (Organisational renewal capability inventory). Found that organisational renewal capability directly influenced organisational performance and it was a reliable instrument. | >0.7 excl. 1 | Yes | Change models |
| [Klemenc-Ketiš et al. [34](#_ENREF_34)] | Survey | Primary care practices | Slovenia | 100 | 60% | 6 domains | Development of a self-assessment questionnaire for QI competences in primary care in Slovenia based on the quality improvement competency framework for family medicine in Slovenia. | >0.9 | Not reported | Change models |
| [Lakhal et al. [35](#_ENREF_35)] | Survey | Manufacturing (plastics, transforming) | Tunisia | 92 | Unstated | 7 practices | Examines how different improvement practices interact and link together to identify the most critical. Uses multidimensional construct for TQM, rather than single which many earlier ones do. | >0.8 (Joreskog's coefficient) | Yes | Improvement models |
| [Lammers et al. [36](#_ENREF_36)] | Survey | Healthcare | USA | 204 (36 sites) | 89% | 4 domains | Development of a quality improvement survey within Veterans Health Association to understand commitment at team leader level. Found that age of the quality council, overall organisation commitment and physician commitment are the most critical variables for predicting improvement activity. | >0.62 | Yes | Improvement models |
| [Lee et al. [37](#_ENREF_37)] | Survey | Healthcare | Korea | 67 | 73% | 4 domains | Research to review the extent of clinical quality improvement implementation in Korean hospitals and to identify the influencing factors. It was observed that larger hospitals tended to have more successful improvement activity. Information technology and the systematic problem-solving approach used were significant predictors of improvement success. | 0.75-0.93 | Yes | Improvement models |
| [Lobo et al. [38](#_ENREF_38)] | Survey | Manufacturing | Australia (New South Wales) | 60 | 4% | 6 constructs | Development of the QMAF model (quality management assessment framework) to developed focused methodology for low performing organisations to reapply strategies from higher performing organisations. Results showed that in this study most organisations had few continuous improvement initiatives and reward systems, and a 'dismal' use of TQM. | Not reported | Not reported | Governance models |
| [Lombarts et al. [39](#_ENREF_39)] | Survey | Hospitals | Europe | 349 | Unstated | 7 domains | Development of an index and maturity classification scheme for quality management in European hospitals. Plan-Do-Check-Act (PDCA) was used as frame to assess maturity level. The index helped to differentiated between different hospital systems and it is suggested that the index be adapted into a 'quick' scan of the organisation. | >0.69-0.89 excl. 1  | Yes | Maturity models |
| [Mohanty, Lakhe [40](#_ENREF_40)] | Survey | Process, textiles, automotive and electronics | India | 175 | 62% | 18 items | Developed a TQM instrument bespoke for Indian industries that will support top management in implementing a TQM programme. The factors in the instrument can be used to develop key measures and goals for a programme that can be tracked.  | >0.7 | Yes | Improvement models |
| [Morris et al. [41](#_ENREF_41)] | Survey | Manufacturing | Australia | 330 (from 14 organisations) | 94% | 7 sections | A survey designed to measure dynamic organisational capability. Tested in Australian manufacturing. Found that successful transitions to a quality culture required a clear vision and strategy, supported by leadership action and team work, detailed planning and resources and time. | 0.71-0.87 | Yes | Improvement models |
| [Nightingale, Mize [42](#_ENREF_42)] | Self-assessment | Aerospace | USA & UK | 10 | n/a | 3 sections | Outlines the development of LESAT (Lean enterprise self-assessment toolkit) for organisations that can be used to assess capabilities. Assessment is done as group consensus process to identify current and desired capability.  | Consensus | Qualitative | Maturity models |
| [National Institute of Standards and Technology [43](#_ENREF_43)] | Framework | All | USA | n/a | n/a | 7 constructs | Within the USA many performance programmes use the Baldrige framework and criteria to improve their results and many accreditation systems are based on the criteria, approximately 100 excellence models are derived from Baldrige including EFQM. | Consensus | Qualitative | Improvement models |
| [Olsson et al. [44](#_ENREF_44)] | Survey | Primary care practices and hospitals | Sweden | 2313 | 46% | 6 categories | Used an organisational capabilities perspective. Swedish healthcare managers were surveyed on their views of improvement activity. Results indicated that most improvement work is localised and introverted with few programmes being strategic, measurable and systematic or externally driven. | Not reported | Not reported | Change models |
| [Parker et al. [45](#_ENREF_45)] | Survey and site visits | Hospitals | USA | 13548 (162 sites) | 68% | 5 categories | This paper collected empirical evidence from Veteran's Healthcare in the USA about quality improvement to assess the relationship between organisational commitment to improvement and implementation abilities. Found that managers need to be committed to improvement and it needs to be central to their strategy and aligned with corporate strategy. | Not reported | Not reported | Improvement models |
| [Peng et al. [46](#_ENREF_46)] | Survey | Electronics, machinery and transportation | 8 developed countries | 238 | 65% | 4 constructs | Examined the strategic impact of improvement and innovation capabilities and their level of fit. The study found that differing competitive priorities require different levels of these capabilities and thus can have varying impact on performance. | >0.57 | Yes | Improvement Models |
| [Politis, Siskos [47](#_ENREF_47)] | Self-assessment | Engineering | Greece | Unstated | Unstated | 13 criteria | Development of MUSABE (multicriteria self-assessment for business excellence) based on self-assessment models and quantitative analysis, and uses stakeholder perceptions. Model can be used to enable operational performance monitoring and progress overtime. | Consensus approach | Consensus approach | Improvement models |
| [Powell [48](#_ENREF_48)] | Survey | Industry | North-east USA | 54 | 33% | 12 variables | Indicates that TQM is pervasive and yet has rarely been researched from a strategic management perspective despite it being an approach for gaining competitive advantage and thus the empirical evidence is reviewed and new study conducted. Findings suggests that 'tools' such as quality training, and benchmarking do not produce advantage however the climate encouraged through TQM such as open culture and empowerment can produce advantage.  | 0.78 - 0.9 | Yes | Improvement models |
| [Prybutok, Ramasesh [49](#_ENREF_49)] | Survey | Defence | USA | 1003 (from 1 organisation) | 21% | 5 factors | Empirical data has been collected through an action research study including a questionnaire, within a site in US manufacturing. Identifies critical factors underlying clinical quality improvement implementation.  | >0.7 | Yes | Improvement models |
| [Pun [50](#_ENREF_50)] | Self-assessment | Government | Hong Kong | 10 (1 organisation) | 42% | 6 criteria | Development of integrated total quality management self-assessment method through an empirical study in Hong Kong. Found that TQM capabilities are increasingly important to boost competitiveness and this will become a strategic necessity. Indicates that management commitment and people well-being are factors that facilitate the integration of TQM into organisations. | Not reported | Not reported | Improvement models |
| [Rao et al. [51](#_ENREF_51)] | Survey | Manufacturing | USA, India, China, Mexico, Taiwan | 780 | 24% | 13 constructs | A conceptual study to develop quality management measures and an instrument that could be used internationally which when tested has good validity and reliability. | >0.83 | Yes | Improvement models |
| [Robert et al. [52](#_ENREF_52)] | Mixed methods | Hospitals | Europe | 10 | n/a | 8 dimensions | QUASER study outlined how a European investigation of how hospitals implement, spread and sustain quality improvement. Has 3 features: quality definition of clinical effectiveness, patient safety and patient experience, conceptualised quality as technical, human, social and organisational accomplishment and seeks to provide guidance within Europe. Further information within Burnett et al. (2015). | Consensus approach | Consensus approach | Change models |
| [Saraph et al. [53](#_ENREF_53)] | Survey | Manufacturing and service | USA | 162 (20 companies) | 91% | 8 factors | Suggests a way of measuring critical factors for quality management based on the work of Deming, and sets about reviewing their essentials to develop survey. Found that there are 8 critical factors and instrument proposed with good reliability and validity. | 0.71-0.94 | Yes | Improvement models |
| [Schilling et al. [54](#_ENREF_54)] | Internal benchmarking and assessment | Healthcare | USA | n/a | n/a | 6 capabilities | Outlines measurement of key domains within quality dashboard used within Kaiser Permanente in the USA. This performance improvement system addresses 6 capabilities, including improvement capability. Indicates that a barrier to sustainability is that some leaders wish to change direction or perceive that subsets of skills such as change management are more important than the whole improvement system. | Not reported | Not reported | Governance models |
| [Schwartz et al. [55](#_ENREF_55)] | Survey | Healthcare | USA | 2142 (7 organisations) | 38% | 4 sections | Summarises survey of organisational and quality factors linked to quality improvement through testing employee perceptions. Suggested that organisations direction, simplified care processes and communication all significant for quality. Training, resources, intergroup co-ordination were perceived as less significant. | >0.7 excluding 1 factor | Yes | Change models |
| [Secanell et al. [56](#_ENREF_56)] | Survey | Hospitals | 7 countries in mainland Europe | 25940 (188 organisations) | 87% | 13 constructs | DUQuE study: A cross sectional study across the EU to understand relationship between quality management and outcomes. The first study of its kind. Assessed areas included quality management systems, compliance and implementation, culture, professionalism and involvement in QM. | Not reported | Not reported | Governance models |
| [Shortell et al. [57](#_ENREF_57)] | Survey | Hospitals | USA | 7337 (61 organisations) | 72% | 9 areas | Found that a participative, flexible, risk taking organisational culture was significantly related to quality improvement implementation, that this in turn was positively associated with patient outcomes and human resources development. Larger hospitals had more bureaucratic and hierarchical cultures serving as a barrier to quality improvement. | >0.7 excluding 1 factor | Yes | Improvement models |
| [Silimperi et al. [58](#_ENREF_58)] | Framework | Healthcare | Latin America and Africa | 12 | n/a | 8 elements | Describes 'capacity building' as critical to the institutionalisation of quality improvement. The framework designed can be used at system or organisational level and describes the development phases, as awareness, experiential, expansion and consolidation leading to a state of maturity, although this is not a linear process. | Not reported | Not reported | Governance models |
| [Solberg et al. [59](#_ENREF_59)] | Survey | Primary care practices | USA | 41 | 100% | 16 factors | Development of survey called Change Process Capability Questionnaire to assess medical group capability to improve care in the USA. Findings were that improvement was related to organisational factors and heterogeneity. Improvement also depended on priorities and wider infrastructure of care support.  | Not reported | Not reported | Change models |
| [Terziovski, Dean [60](#_ENREF_60)] | Survey | Service sector (medium to large firms) | Australia | 130 | 23% | 14 outcomes | Cross sectional study to examine quality management practices on quality outcomes including productivity, competitive advantage, customers and morale. Results show importance of strategically planning for quality, and both involving customers and workers.  | Not reported | Not reported | Governance models |
| [Ulrich, Lake [61](#_ENREF_61)] | Case study | Service and manufacturing | USA | 2 | n/a | 4 elements | Argues that three mainstream capabilities for competitiveness, technological, strategic and financial are insufficient and there is fourth complementary one, which is organisational, directly related to people. Critical areas within this capability are mindset, management practices, capacity for change and managing organisational systems and empowerment.  | n/a | Not reported | Change models |
| [Valmohammadi [62](#_ENREF_62)] | Survey | Manufacturing | Iran | 65 | 82% | 7 factors | Development of instrument for use in total quality management, found significant relationship between TQM practices and performance, and that some of these practices need development. | >0.7 excluding 1 factor | Yes | Improvement models |
| [Wagner et al. [63](#_ENREF_63)] | Survey | Healthcare & social care, 1182 orgs | Netherlands | 1182 | 74% | 5 factors. | Developed a survey instrument for organisations to measure and compare quality systems in healthcare provision. Used measures linked to quality assurance and quality improvement. Found that the instrument was valid and reliable for use in health and social care settings and applicable to these different groups. This instrument would complement other audits. | >0.75 | Yes | Governance models |
| [Wali et al. [64](#_ENREF_64)] | Survey | ISO 9000 companies | India | 114 | 22% | 12 factors | Develops critical success factors for TQM implementation based on survey of Indian companies and review of mainstream literature, adds factors not included in others and in awards, e.g. congeniality of atmosphere.  | >0.91 | Yes | Improvement models |
| [Warwood, Antony [65](#_ENREF_65)] | Survey | Manufacturing and non-manufacturing | UK | 10 (survey 1); 54 (survey 2) | 30% (survey 1); 54% survey 2; | 9 factors  | Results of a self-assessment survey for TQM for industry. Found that the most significant factors in successful TQM implementation in the UK included leadership, impact of other improvement programmes, measurement and culture. | Not reported | Not reported | Improvement models |
| [Wu et al. [66](#_ENREF_66)] | Survey | Non-manufacturing based. | USA | 62 (group 1)) and 160 (group 2) | 30% (group 1) and 6.5% (group 2) | 10 constructs | A paper describing the construct of operational capabilities and the challenges of imitation and measurement, as they are tacit and embedded and context dependant. A taxonomy with six capability areas is articulated including operational improvement with associated measurement scales. | Indicated | Yes | Improvement models |
| [Yen-Tsang et al. [67](#_ENREF_67)] | Case study | Transport, metals, Foundry | Brazil | 3 cases | n/a | 8 areas | A study using a behavioural theoretical lens to investigate the antecedents of continuous improvement capability based on operational routines. Suggests the ‘will to improve’ also critical to capability although the data only partially supports this hypothesis.  | Consensus approach | Consensus approach | Maturity models |
| [Yeung et al. [68](#_ENREF_68)] | Survey | Electronics | Hong Kong | 225 | 75% | 17 areas | Development of a classification system to identify different types of quality management systems (QMS). 3 classes identified as: undeveloped, frame, accommodating and strategic. Article found that QMSs develop at different maturity levels/speed depending on the prevailing view of quality management. Top level described as strategic quality system and an 'aggressive long term strategic weapon' | >0.7 | Yes | Governance models |
| [Zeitz et al. [69](#_ENREF_69)] | Survey | Various | USA | 886 respondents | >95% | 12 dimensions | A realisable and valid instrument with 23 dimensions is proposed for measuring TQM and has been tested with respondents from several sectors. This can be used to evaluate improvement and organisational development interventions through use of information and analysis. | >0.65 | Yes | Improvement models |
| [Zhang et al. [70](#_ENREF_70)] | Survey | Manufacturing | China  | 212 | 24% | 11 constructs | Develops an instrument to measuring TQM with high external validity for Chinese manufacturing for evaluating and improving TQM programmes.  | 0.8377-0.9245 | Yes | Improvement models |

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