Steps and theories towards more effective business case processes within existing organisations: an inter-disciplinary systematic literature review

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Abstract

Purpose – Business case (BC) analyses are performed in many different business fields, to create a report on the feasibility and competitive advantage of an intervention within an existing organisation to secure commitment from management to invest. However, most BC research papers on decisions regarding internal funding are either based on anecdotal insights, on analyses of standards from practice, or focused on very specific BC calculations for a certain project, investment or field. A clear BC process method is missing.

Design/methodology/approach – This paper aims to describe the results of a systematic literature review of 52 BC papers that report on further conceptualisation of what a BC process should behold.

Findings – Synthesis of the findings has led to a BC definition and composition of a 20 step BC process method. In addition, 29 relevant theories are identified to tackle the main challenges of BC analyses in future studies to make them more effective. This supports further theoretical development of academic BC research and provides a tool for BC processes in practice.

Originality/value – Although there is substantial scientific research on BCs, there was not much theoretical development nor a general stepwise method to perform the most optimal BC analysis.

Keywords Business case, Return on investment, Intervention, Resource allocation, Stakeholders, Performance

Paper type Literature review

Introduction

Business cases (BCs) are commonly used as tools to evaluate an action on its fit to business goals. However, internal business decision making is becoming more and more complex, due to social and environmental considerations and interactions with increasingly more stakeholders (Choi *et al.*, 2019). The development of a BC has therefore been said to be a key business process for project and organisational success and competitiveness (Fortune and White, 2006). Nonetheless, in practice when making business decisions, a recent study showed that *"spreadsheets were the second most used tool behind wall and paper."* (Anke, 2019, p. 4). As Anke

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puts forward, this is peculiar considering that spreadsheets contain various types of errors which impede their use for business decisions. A BC can also *"... range from a highly comprehensive and well structured document to an informal briefing and may aim to seek funding or approval, or may seek to influence a policy making process"* (Quashie *et al.*, 2017, p. 105). What is included/emphasised in a BC varies depending on the type of business and how the success of a BC (or business competitiveness) is addressed. And despite company drivers, compensation systems may not always encourage decision makers to decide for the option that creates long-term shareholder value (Siegrist *et al.*, 2020).

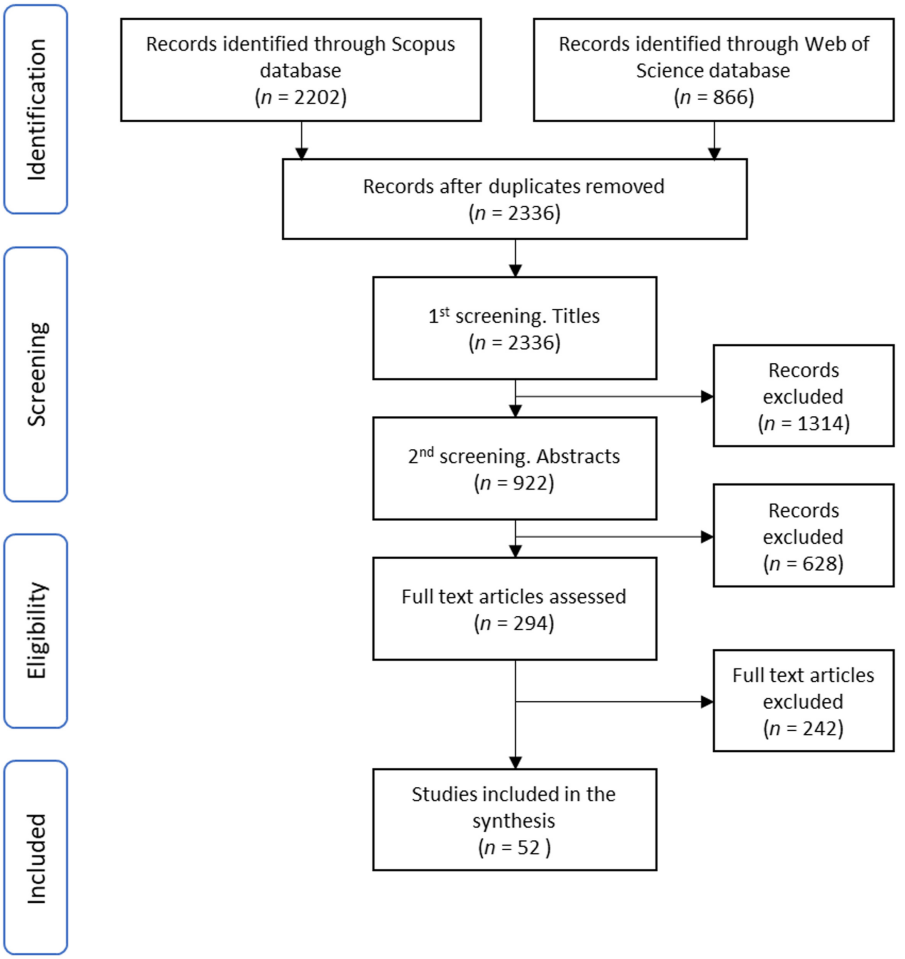
The past decades, several fields have seen extensive publications on how to calculate a BC on a field-specific topic to support decision making. Although there are many such studies, there is not much scientific research into what a BC process should behold in general (Ssegawa, 2019; Berghout and Tan, 2013). Most BC studies do not appear to be based on clear theoretical frameworks either (Lee, 2018). Papers that do discuss the setup and components of a BC are either based on anecdotal insights from the author's expertise (e.g. Bishop, 2019; Tabbush, 2018), on analyses of documents or standards from practice (e.g. Ssegawa, 2019), or contain very specific BC calculations for a certain project or investment in a specific field (e.g. Unruh *et al.*, 2011; Casier *et al.*, 2008; Greene *et al.*, 2008). A generic overview of BC steps and insights in relevant theories for scientific advancement of BC studies appears to be missing. This prevents the fields where BCs are not yet common to embrace their use, or they might try to reinvent the wheel. The specific BC processes that are seen in some fields now, are not easily transferred to another field and make BCs less credible or comparable. Therefore, the inter-disciplinary approach of this paper aimed to synthesise distinct BC research traditions into one overview, to support business management in tackling current challenges of effective decision making.

The "*... key for developing a strong business case is a fundamental understanding of how each of its elements, models and concepts fit together*" (Quashie *et al.*, 2017). As far as the authors know, there is no generic inter-disciplinary review paper on what a BC process should behold, which steps to consider, and which theories are relevant for further theoretical development of BC analysis in general. Therefore, this paper discusses the findings of a systematic literature review of BC papers that either provided a (non-specific) framework/model with process steps/elements or discussed relevant theories for BC analysis. Very specific, detailed BCs with a strong mono-disciplinary focus were not included. From the review, a BC process method with essential steps and a list of relevant theories for further theoretical development were deducted.

Methods

The study followed the guidelines of a PRISMA structured literature review (Page *et al.*, 2021; see Figure 1). The search was performed in Scopus and Web of Science databases by using the keyword "business case" in combination with "create", "framework", "model", "component", "approach", "concept", "tool", or "assessment". These keywords were chosen due to the focus of this research – a theoretical underpinning of a generic BC. It did not include "investment case", "ROI case", "investment paper" or "business plan" because those keywords yield either too narrow financial views on specific cases, focused on financial calculations or too wide views on business development, thus directing away from the theoretical development and understanding of a BC process as a concept. In both databases, keywords were searched in the title, abstract or keywords. The documents needed to be written in English and classified as either an article or a review. The search included articles published from 1945 to 2021 (last search update date was March 20, 2022).

Scopus yielded 2,202 publications and Web of Science 866. Removing duplicates provided 2,336 papers for initial screening. As common in the PRISMA method, during the first screening step only the titles of the publications were reviewed. Publications were removed if



Source(s): Adapted from Page *et al*., 2021

Figure 1.
PRISMA Flow diagram

the titles clearly stated that the publication included a "case study" rather than a "business case", or when they otherwise could be indicated as an irrelevant publication for the aim of this study (= minus 1,314 records). In the second screening step, abstracts were read and inclusion was based on the following criteria: either a BC composition is presented, theoretical BC process development is discussed, or BC elements are identified. Abstracts were thus excluded if the paper only discussed BCs as a case study teaching tool for students or as a specific case study calculation for a specific business/industry problem (= minus 628 records). The remaining 294 articles were read in full, which were published between 1992 and 2021 and in 236 different journals (particularly in the *Journal of Cleaner Production*, 12 articles; *Applied Energy*, 7 articles; *Sustainability and Journal of Business Ethics*, both 4 articles; and *Journal of Nursing Administration*, 3 articles).

In the last step, the full text articles were evaluated. Another 15 publications were excluded due to not being available full-text, and 3 were not published in a scientific journal. Also, 53

publications were removed because they did not discuss the BC but rather business models, different types of business analyses or effects of a BC on something else. In addition, 171 publications were excluded because they discussed a very specific BC without referring to the previous literature, providing theories or theoretical models/frameworks or identifying elements or steps to be included in a BC. Ultimately, 52 publications remained for the systematic review.

Systematic review of these 52 papers focused on the following aspects: BC definitions, steps/components of the BC, and underlying theories that help explain BC processes. The definitions that were provided were analysed on their main terms and include in an overall best definition. The labels of the steps/components that papers put forward were analysed to identify overlap and the most common sequence from start to end. Under the assumption that those papers with more steps are likely to report more detailed steps, this comparison started from those models/frameworks with the least steps and then fitted the more extensive step/element lists within those. Last, all theories that were mentioned in the papers were assigned to the different process steps where they can help BC research become more rigorous.

Results

Descriptives

The 52 selected papers were published in 2003 or later with the exception of one from 1995 (see Figure 2). Most of the selected papers (36 out of 52) stem from 2013 or later years, with a clear emphasis on the last few years, particularly 2018–2020. Surprisingly, only one paper from 2021 was added to the final selection, although in total 18 papers were included in the long list.

As mentioned earlier, there is no specific journal focused on BC process studies. The selected papers were published in 41 different journals, with 1 journal publishing 3 papers (*International Journal of Project Management*) and 5 journals with 2 papers (*Applied Energy, IEEE Engineering Management Review, Construction Management and Economics, Sustainability Switzerland, and Journal of Business Ethics*). So, the topic of BCs is

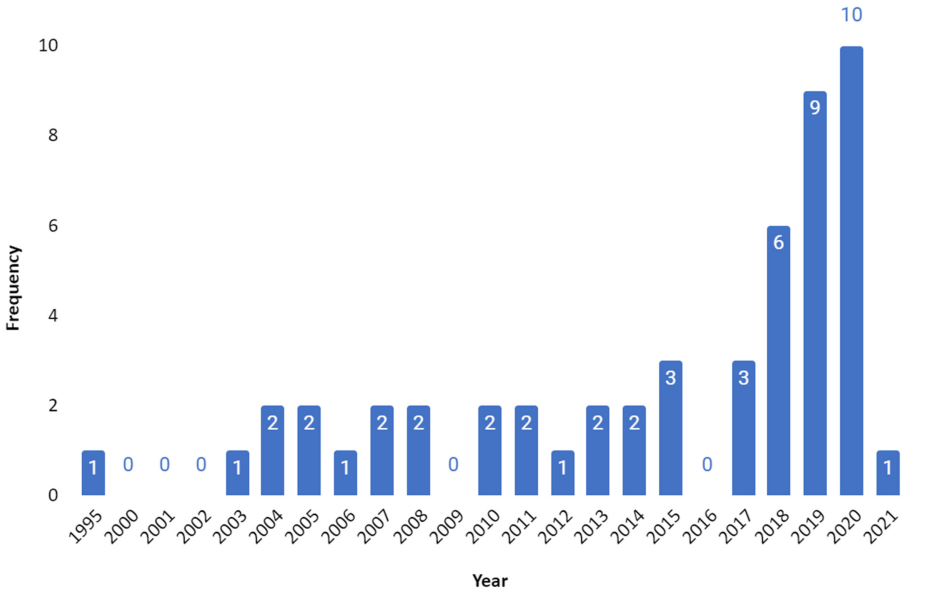


Figure 2.
Frequency of the year of publication for the final list of selected articles

widespread amongst several fields. Regarding the topic/field of the selected papers, only 3 focused on BCs in general (Bishop, 2019; Ssegawa, 2019; Eckartz *et al.*, 2012). Two topics/fields were recurring most (see Table 1), namely the sustainability field, with sub-topics like corporate sustainability (9 papers), corporate social responsibility (4 papers), renewable energies (2 papers) and sustainable business (2 papers), and health related research, with sub-topics like healthcare (13 papers) and occupational health (3 papers). A third field regarded technologies, such as information technology (IT) projects (5 papers) and new technologies (3 papers). Less common fields were public projects (4 papers), infrastructure (2 papers), knowledge management (1 paper) and government policy (1 paper).

The IT field appeared to be the furthest along in developing a BC process. For example, Berghout and Tan (2013) extracted 9 elements for a BC from a systematic literature review of papers on IT projects (which identified only 8 previous studies on BC elements). Later, Einhorn and colleagues published a set of papers (Einhorn *et al.*, 2019, 2020; Marnewick and Einhorn, 2019) about their suggestion for 37 process steps of an IT focused BC of 8 elements. Outside the IT field, Lee (2018) performed a systematic review of BC studies in the field of occupational health and safety (which identified only 12 previous studies). The biggest systematic selection of previous research has been done by Rodrigues *et al.* (2018), identifying 87 previous studies, but their keywords focused on logic models and not specifically on BCs.

The research methods that are used in the selected articles differ a lot. Some were written in a narrative way based on experience and the opinion of the (mostly single) author (e.g. Bishop, 2019; Tabbush, 2018; Shirey, 2011; Cervone, 2008). Others had a narrative (e.g. Sasse-Werhahn *et al.*, 2020; Siegrist *et al.*, 2020) or systematic literature review approach (e.g. Rodrigues *et al.*, 2018; Lee, 2018; Zadeh *et al.*, 2015; Schmidek and Weeks, 2005), did a content analysis of BC documents in practice (e.g. Linton *et al.*, 2019; Pronk *et al.*, 2015), held interviews (e.g. Riley *et al.*, 2020), set up surveys (e.g. Zaitsev and Dror, 2020) or combined different methods (e.g. Eisman *et al.*, 2020; Gannon and Smith, 2011). A couple of papers (e.g. Nielsen and Persson, 2017; Sarkis and Liles, 1995) were based on design/action research where frameworks were developed together with practitioners. Also, specific calculations were made for real cases (e.g. Quashie *et al.*, 2017) or fictive ones (e.g. Jonker *et al.*, 2017) after generic frameworks were created first.

Topic/field	Count	Paper ID (see Appendix 1 for corresponding article)
Sustainability		
Corporate Sustainability	9	2, 21, 27, 63, 78, 80, 210, 265, 286
Corporate Social Responsibility	4	33, 71, 121, 172
Renewable Energies	2	23, 97
Sustainable business	2	53, 60
Health		
Healthcare	13	11, 35, 48, 81, 115, 119, 158, 187, 191, 195, 203, 216, 228
Occupational Health	3	82, 83, 230
Technologies		
IT projects	5	14, 41, 257, 263, 267
New technologies	3	132, 249, 290
Other		
Business case setup	3	55, 62, 148
Public projects	4	8, 54, 130, 166
Infrastructure	2	95, 127
Knowledge management	1	221
Government policy	1	171

Table 1. Topics/fields of selected publications

BC definitions

While most papers did not provide an explicit definition of a BC, 28 of the 52 selected papers did describe it in one or two sentences. Berghout and Tan (2013) even compared definitions in their systematic literature review on BC's for municipal IT projects, but unfortunately did not decide on a preference for one and also did not self-compose the "ultimate" definition. From those definitions, terms that were counted more than once (or synonyms) were listed in Appendix 2 and collated into a complete definition. From these 28 papers, 20 mentioned that a BC provides some kind of justification (with many synonyms). The BC definitions were mostly focused on a document (n = 6) within an organisation (n = 7) about a project (n = 13) or more generally an intervention/change/cause (n = 9), for which they want to secure commitment/approval/support from management (n = 8) for an investment (n = 14) decision (n = 3) on resource allocation (n = 4). Besides management, other stakeholder (n = 2) roles and needs (n = 2) were identified for a broader view on the context. According to the definitions, a BC tries to seek commitment by understanding (n = 3) different aspects such as costs (n = 8), benefits/results/outcomes (n = 9) and risks (n = 6) of possible solutions (n = 6) and their financial/economic or other return on investment (ROI) (n = 8) to come to a recommendation (n = 2). Last, some of the definitions seemed to search for SMART objectives, including this acronym's terms such as specific (n = 2), measurable/quantifiable (n = 3), reasonable to attain (n = 3) and time frame (n = 5). Three very long definitions were proposed by Einhorn *et al.* (2019), Marnewick and Einhorn (2019), and Shirey (2011). Their definitions mentioned a lot of the aspects identified above (but not all), plus all added a "later-stage" purpose of a BC after the intervention. These longer definitions noted that a BC should be reviewed (n = 2) after the implementation (n = 3).

Due to the fact that there were no agreed definitions for a BC and each industry/field takes their own approach to the term (often omitting parts of the BC), a new, complete definition of a BC is proposed here:

> A BC documents costs, benefits, risks, and return on investment of (a) feasible alternative intervention(s) regarding an object, activity or otherwise within an organisation's scope, to come to an understanding and recommendation that helps to justify and secure commitment from management for an investment or other resource allocation in order to start a change process. It regards all stakeholder roles and needs and defines objectives in a SMART (specific, measurable, attainable, relevant and time-based) way, and is used to review performance on expected outcomes throughout the project's life cycle.

BC framework/model elements

Of the 52 selected papers, only 37 suggested steps or elements of a BC. Of these 37 papers, 25 referred to an existing framework/model to set up their BC (see Table 2). The rest described steps and/or elements for their BC analyses, without insight how these were determined. Some of the frameworks/models that were used were more generic, such as systems thinking (Jonker *et al.*, 2017), real options analysis (Tahon *et al.*, 2013) and multi-criteria decision making (Riley *et al.*, 2020), while others stemmed from a specific disciplinary field such as the BC process groups from the IT project field (Einhorn *et al.*, 2019, 2020), EcoM2 from the sustainability field (Rodrigues *et al.*, 2018) or the value based care model from healthcare (Bartlett-Ellis *et al.*, 2015). Some papers referred to other developed frameworks specifically for the BC purpose in their fields, for example, a BC for ergonomic interventions (Seeley and Marklin, 2003), or for information systems (Nielsen and Persson, 2017; Ward *et al.*, 2007).

On average, the 37 papers that suggested steps/elements identified 6.8 different steps, with a maximum of nineteen (Ssegawa, 2019) and a minimum of three steps to start from (e.g. Probert *et al.*, 2013; see Figure 3). The studies from Einhorn *et al.* (2019, 2020) identified 37 sub-steps of the eight main steps that they proposed, so this could have potentially been seen as an

even longer list. However, these sub-steps were not elaborated on in much detail in their papers and therefore only the eight main steps were used in this review.

When all the lists of steps were laid on top of each other, 3 main phases with a flow through 20 sub-steps came forward (see Figure 4 and Appendix 3 for the underlying tables in a detailed analysis of steps per publication). The simplest BC setup was from Williams *et al.* (2020), dividing a BC in 3 phases: identify, execute and sustain, which was chosen as the basic setup of the BC process. The "heart" of the BC analyses – Execute – was present in all 37 papers that identified steps/elements. But while the preparatory work – Identify – also had items in 34 of the papers, the afterwork – Sustain – could only be identified from steps/components in 13 papers. This confirmed Einhorn *et al.* (2019) who also mentioned that most organisations do not check the BC after the decision to start had been made. The lack

Framework/model	Count	Paper ID (see Appendix 1 for corresponding articles)
3 × 3 cube	1	80
Activity-based accounting standards	1	216
APM body of knowledge	1	60
BC process groups	3	14, 41, 257
Benefits management framework	1	8
BC for ergonomic interventions by Boff and Rouse (1997)	1	230
BC for quality	2	187, 195
COINS (cost of implementing new strategies), based on SIC (Stages of Implementation Completion)	1	35
Deming's cycle	1	119
EcoM2	1	78
IMPaKT framework (Improving Management Performance through Knowledge Transformation)	1	221
Information systems BC framework by Ward *et al.* (2007)	2	263, 267
Multi-criteria decision-making (MCDM)	2	23, 290
Quality function deployment (QFD)	2	33, 249
Real options analysis	1	127
Social ROI	1	82
Systems thinking	1	97
Technology management framework by Centindamar *et al.* (2009)	1	132
Value-based care model	1	115

Table 2.
Frameworks/models used in the selected papers

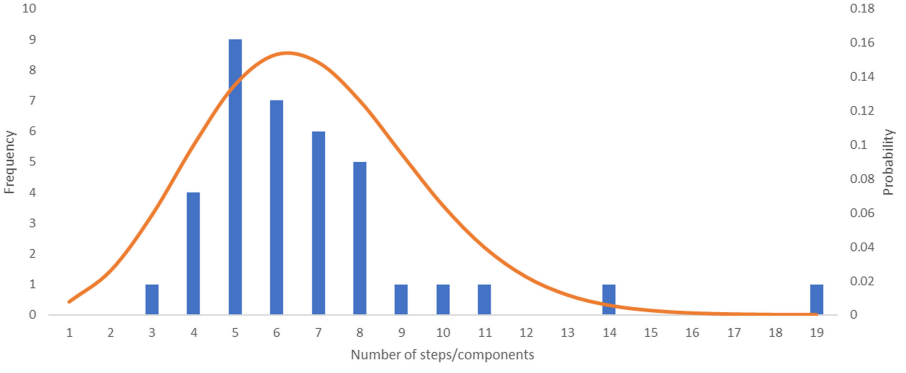


Figure 3.
Distribution of steps/components of the reviewed BC models/frameworks

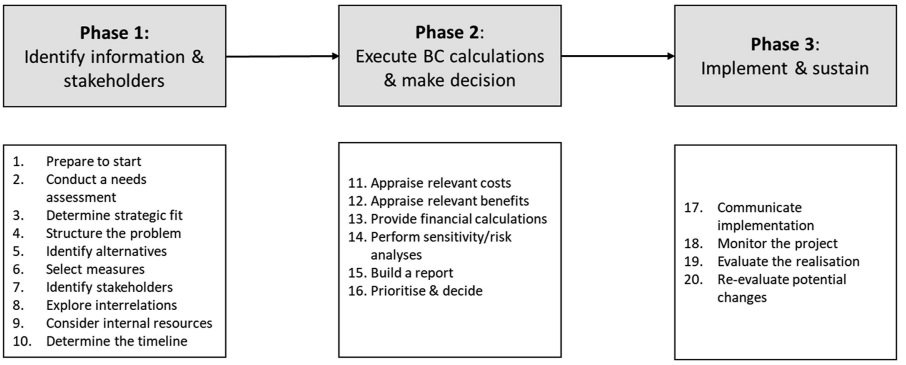


Figure 4.
Identified phases and steps of a BC

of afterwork was also visible during the analysis of BC definitions that is discussed in the previous section. Below the ultimate 20 sub-process steps are explained per phase.

Phase 1: identify information and stakeholders. The 34 papers that identified steps for this first phase distinguished many to be taken before doing the actual financial calculations that a BC is generally associated with (see Figure 4). The BC models differed from 1 step for this phase either looking at clarifying what problem to address (Velenturf and Jopson, 2019; Jonker *et al.*, 2017; Schmidek and Weeks, 2005) or which stakeholders to include (Tabbush, 2018; Seeley and Marklin, 2003), up to 14 steps (Schaltegger *et al.*, 2019). Figure 4 shows the different steps in the papers (see also Appendix 3 for three large tables that show the detailed comparisons of steps in each reviewed paper). Overall, the following 10 steps were identified this way, corresponding with the numbers in Figure 4.

(1) *Prepare to start:* choose a problem to analyse (Robinson *et al.*, 2004) and determine conditions for starting a BC study (Bailit and Dyer, 2004).

(2) *Conduct a needs assessment:* identify drivers, needs (Quashie *et al.*, 2017) and motivations (Nielsen and Persson, 2017) for what outcomes are desired (Zaitsev and Dror, 2020).

(3) *Determine strategic fit:* determine whether the problem is a strategic priority (Linton *et al.*, 2019) and fits with the mission, vision and strategic context (Bartlett-Ellis *et al.*, 2015).

(4) *Structure the problem:* define the problem in more detail, by doing a situation analysis (Ssegawa, 2019), identifying capability gaps (Zaitsev and Dror, 2020) and/or preliminary analyses.

(5) *Identify alternative options:* identify alternatives/solutions (Ssegawa, 2019) and constrain them (Riley *et al.*, 2020) by studying them.

(6) *Select measures:* select indicators (Zaitsev and Dror, 2020) how to measure progress towards objectives and key benefits (Kos *et al.*, 2008).

(7) *Identify stakeholders:* identify key stakeholders (Seeley and Marklin, 2003) and understand where you share values and vision (Pronk *et al.*, 2015).

(8) *Explore interrelations:* identify cause and effect relations (Robinson *et al.*, 2004) that the solution(s) could deliver (Ssegawa, 2019).

(9) *Consider internal resources:* consider constraints in building a team (Bartlett-Ellis *et al.*, 2015) and tools for implementation (Robinson *et al.*, 2004).

(10) *Determine the timeline:* determine the time horizon (Reiter *et al.*, 2007) for an intervention plan (Bartlett-Ellis *et al.*, 2015).

Phase 2: execute BC calculations and make decision. All papers with a framework/model provided sub-steps for this phase of the BC process. Again, some only mentioned this as one single step, where others distinguished up to five sub-steps. This step (see Figure 4) regarded the financial calculation and decision making, which is generally considered the essence/heart of a BC process. There was much consistency in the sub-steps, especially in the first four, which were included in almost all of the papers.

(11) *Appraise relevant costs:* identify and appraise relevant costs of the intervention.

(12) *Appraise relevant benefits:* identify and appraise relevant benefits/outcomes, including reduced expenditures (Bailit and Dyer, 2004).

(13) *Provide financial calculations:* calculate economic measures such as cost-benefit analysis (CBA) or ROI, and compare to a hurdle rate (Tabbush, 2018).

(14) *Perform risk/sensitivity analyses:* perform sensitivity analyses to rank alternatives (Riley *et al.*, 2020) and study potential risks and contingency plans (Kos *et al.*, 2008) to address the probability of success (Robinson *et al.*, 2004).

(15) *Build a report:* communicate the BC results (Pronk *et al.*, 2015) to make your case (Perencevich *et al.*, 2007) and embed it (Watson, 2018).

(16) *Prioritise and decide:* prioritise against other projects (Einhorn *et al.*, 2020) and make a decision (Bishop, 2019)

Phase 3: implement and sustain. In many papers this last phase was identified as a single step, which was labelled with terms like sustain, implementation (Jonker *et al.*, 2017), consolidation (Berghout and Tan, 2013), evaluation (Linton *et al.*, 2019; Bartlett-Ellis *et al.*, 2015) or leadership (Pronk *et al.*, 2015). Those were focused on keeping an eye on progress once the intended change is implemented. But a few of the more extensive lists provided further detail in up to 6 sub-steps what this last phase could behold. Our analyses decided on 4 sub-steps for this phase (see Figure 4).

(17) *Communicate implementation:* implement the intended intervention and communicate to all stakeholders during this process (Zadeh *et al.*, 2015).

(18) *Monitor the project:* monitor the project and document it (Einhorn *et al.*, 2020).

(19) *Evaluate the realisation:* evaluate realisation of benefits (Einhorn *et al.*, 2019) with the identified quality metrics (Zadeh *et al.*, 2015).

(20) *Re-evaluate potential changes:* re-evaluate potential changes to original plan (Sasse-Werhahn *et al.*, 2020) and communicate BC review back for future learning purposes (Zadeh *et al.*, 2015).

Theoretical development

Only 27 of the 52 papers mentioned a theory (or several) that was relevant for BC processes. Many of these papers were from the sustainability field, which suggests that this field might be most advanced in trying to build theoretical "rigour" into BC studies. Additionally, some theories were identified in papers from the IT field. No convergence into a specific overall theory was found in any of the papers, nor an identification of the most relevant theories across fields. Therefore, all theories in the selected papers are discussed here in light of the 20 identified steps for the BC process that they could be relevant for (Table 3). In future studies, these theories could

Step	Theory
2. Conduct needs assessment	Resource-based view theory
	Value/benefit management approach
	Paradox theory
	Practical wisdom theory
6. Select measures	Utility theory
7. Identify stakeholders	Stakeholder theory
	Theory of corporate social responsibility
8. Explore interrelationships	Supply and demand theory
	Trade-off hypothesis
	Social impact hypothesis
	Available funds hypothesis
	Coordination theory
	Variance theory
11. Appraise relevant costs	Activity management approach
13. Provide financial calculations	Fuzzy set theory
14. Perform risk/sensitivity analysis	Real options theory
	Game theory
	Institutional theory
16. Prioritise and decide	Managerial opportunism hypothesis
	Cognitive framing
	Agency theory
	Cognitive categorisation theory
17. Communicate implementation	Signalling theory
	Legitimacy theory
18–20. Monitor and (re-) evaluate	Total quality management approach
BC process in total	Process theory
	Theory of Change
	Complex systems theory
	Control theory

Table 3.
Theories for BC steps

be used to enrich these steps and perhaps to develop a meta-theory for BC processes in business decision-making.

Phase 1: identify information and stakeholders. Phase 1 was the most extensive phase in terms of both the number of steps and proposed theories. Several theories can be used for step 2 (conduct needs assessment), where those involved in the BC process need to think about which goals/benefits to aim for by addressing a certain problem. Perhaps the most well-known theory in terms of gaining a competitive advantage with the available internal resources is the resource-based view theory (also known as the resource-advantage theory) (Siegrist *et al.*, 2020). It suggests that organisations must focus on developing unique, firm-specific core competencies that will allow them to outperform competitors by doing things differently (Prahalad and Hamel, 1990). On the other hand, Nielsen and Persson (2017) discussed the value/benefit management approach that focuses on benefits that can be achieved with a certain project (and selecting the best ways to measure them). It aims to improve and sustain a balance between the needs and wants of stakeholders and also relates to the resources needed to satisfy them (IVM, 2022). Carroll and Shabana (2010) named two views to BC values; economic or management. They wrote that the economic view concentrates on the financial performance, while the management view looks broader, studying direct and indirect relationships between the financial performance and different initiatives. Another one focused on benefits is paradox theory, discussed in three of the papers. Desired benefits might appear contradictory to each other and this theory states that such tensions "*might be better addressed as a dynamic equilibrium than through alignment or prioritization*" (Sasse-Werhahn *et al.*, 2020). Walker *et al.* (2020) added that managers that

accept tensions between aims can transcend them. They claimed that one cannot exist without the other anyway, because of the dynamic relationship between them, and add that focussing on one dimension only will exacerbate the other. Paradox theory provides several approaches for managing tensions between certain elements of the BC, related to time, organisational barriers and lack of control over the process (Sabini and Alderman, 2021). Another theory to overcome such tensions is practical wisdom theory *et al.* As Sasse-Werhahn *et al.* (2020) stated, "*wisdom accepts the complex, cuts through ambiguity, and derives its energy from the tensions and uncertainties of a complex world.*" They also pointed out that this dates back to Aristotle and the term phronesis: "*a true and reasoned state of capacity to act with regard to the things that are good or bad for man*".

Next, a substantial set of theories could improve steps 6–8. Although decision makers sometimes have a narrow financial perspective, increasingly a broader view is preferred, especially in the sustainability field. Five papers from this field with diverse stakeholders have suggested many theories that can help identify metrics, stakeholders and interrelationships. Regarding step 6 (select measures), Schaltegger *et al.* (2019) suggested that utility theory could provide important insights on value creation with a proper BC process. They stated that "*Another way to overcome the very narrow, monetary perspective on economics and business is to not use financial and monetary indicators as proxies for utility, but instead to directly analyse how a business activity creates utility for its stakeholders and fosters sustainable development.*" They also claimed that such a focus could allow companies to better deal with unexpected changes and to increase their innovativeness.

For step 7 (identify stakeholders), Schaltegger *et al.* (2019) also introduced a theory, namely stakeholder theory, which puts forward that the key objective of a business or project is to create value for all stakeholders involved (this theory was also mentioned by Carroll and Shabana (2010), and Salzman *et al.* (2005)). Related to this, Bartlett-Ellis *et al.* (2015) based their BC model partly on the theory of corporate social responsibility, which as they said "*speaks to organizations' legal and moral obligations. The legal obligation is to be financially responsible, and the moral obligation is to interact ethically with the communities they serve.*" (p. 339). A wide range of stakeholders was identified, such as employees, customers, suppliers, governments, credit lenders and financiers.

Salzman *et al.* (2005) further analysed the relationship between financial, environmental and social performance and provided a list of theories that explain how those relationships are relevant for step 8 (Explore interrelationships). First of all, they mentioned supply and demand theory which puts forward that firms supply a demanded and unique level of environmental and social performance, specifically to maximise their own profits. They also mentioned the trade-off hypothesis that firms always try to pursue optimal capital and that environmental and social performance leads to lower financial performance. But they also introduced two theories that contradict this: (1) the social impact hypothesis**,** that meeting the needs of various non-owner stakeholders would positively impact financial performance and (2) the available funds hypothesis (also known as the slack resources theory) that higher financial performance of firms in turn allows them to allocate more resources to environmental and social performance. For this complexity of interests (and stakeholders), Eckartz *et al.* (2012) suggested applying co-ordination theory. It emphasises the need to understand the dependencies between different tasks and stakeholders in order to carry out a successful BC. Several papers mentioned that strategic decision-making and strategic planning requires business elements to be arranged in a way that supports the purpose of the business (Robinson *et al.*, 2004; Hahn *et al.*, 2014). Last, according to Einhorn *et al.* (2020) process theories are often contrasted or supplemented with variance theories. Variance theory is focused at explaining the variance in a dependent variable based on one or more independent variables, so it seems relevant for this step too. While process theories help clarify how something happens, variance theories clarify why something happens.

Phase 2: execute BC calculations and make decision. The approach to BC calculations and decision-making varied slightly throughout the papers. For the first two steps of this phase (11. Appraise relevant costs, 12. Appraise relevant benefits) no theories have been mentioned, which might not be necessary as they are rather practical steps oriented at calculations. However, Schmidek and Weeks (2005) did mention the activity management approach for understanding costs and their consequences. It focuses on understanding activities and the costs that are associated with them to improve value for customers and own profits (Turney, 1992). Also, several papers pointed out difficulties with determining the costs and quantifying the benefits (e.g. Perencevich *et al.*, 2007; Schmidek and Weeks, 2005). Regarding costs, generally a distinction was made between fixed, variable, direct and indirect costs (Fischer and Duncan, 2020). Bailit and Dyer (2004) also discussed cost avoidance or costs of doing nothing. Regarding benefits, Williams *et al.* (2020) found that there was not really a standardised system yet for their classification. They showed examples of BCs distinguishing between financial and non-financial benefits, direct and indirect, external and internal, recurring and non-recurring, primary and secondary benefits, and several others. Robinson *et al.* (2004) added a further potential distinction between operational and strategic benefits.

For step 13 (provide financial calculations), Fischer and Duncan (2020), Lee (2018) and Grosse *et al.* (2006) identified three main approaches.

(1) Return on investment (ROI); A money, ratio or percentage calculation defined as the net value of the investment/cost of the investment.

- A manipulation of the ROI is the net benefits analysis, expressed as the value of all benefits − value of all costs.
- Reiter *et al.* (2007) described different ROI measures – net present value (NPV), rate of return (RoR) and cost-benefit ratio.

(2) CBA: A ratio defined as the value of all benefits/value of all costs and reported as the value of benefits realised for each spent monetary unit. A variant is the balance sheet method, which lists all effects on the resources on one side of the ledger, and all the effects, positive and negative, on the consumer side.

(3) Cost-effectiveness analysis (CEA); A comparison of the cost of an intervention to its effectiveness (C/E ratio) as measured in outcomes, reported as a monetary amount per outcome averted or gained, for example:

- Incremental cost-effectiveness ratios; A type of CEA used when comparing two or more interventions and defined as the difference in costs between groups divided by the difference in outcomes between groups
- Cost-utility analyses; A type of CEA where the outcome is expressed in terms of a standardised outcome

Perencevish *et al.* (2007) also separated CBA analysis (as net financial benefit or loss) and CEA (as cost per unit). Bartlett-Ellis *et al.* (2015) distinguished CBA and CEA too but added cost-avoidance analysis as a third common approach (within the healthcare field). Cost-avoidance was also mentioned by Bailit and Dyer (2004) as one of the financial considerations, together with ROI and cost-of-doing-nothing. Similarly, Robinson *et al.* (2004) identified four techniques: CBA, CEA, cost-minimising analysis and cost-utility analysis as being used in the knowledge management field. They explained that the selection of the suitable technique depends on a number of initiatives at a time and the expression of outputs.

Volden (2019) identified 3 categories of weaknesses of all these types of calculations (at least when viewed from a public project's point of view), being.

(1) The normative fundament; it is focused on consumers only, not on other objectives like political goals or the welfare of future generations (as potential solution, Volden discussed multi-criteria decision making and/or presenting all costs and benefits, not just aggregated effects).

(2) Various measurement problems; info at an early stage is based on assumptions which creates risk, normally only direct effects are included, and some impacts are hard to quantify. For the latter, Dayo-Olupona *et al.* (2020) suggested Fuzzy set theory to solve the vagueness of human mind, as they call it. This mathematical approach is aimed at dealing with vague and subjective judgements to quantify the difficult to quantify.

(3) Challenges relating to appraisal optimism; own abilities and control over the situation are exaggerated (as potential solution, Volden suggested ensuring an additional outside view, ex-post evaluations to learn for the future and incentives for true speech).

Additionally, Reiter *et al.* (2007) pointed out that the results of financial (ROI) analyses also depend on the ability to clearly determine a time horizon, a right discount rate and risk assessment and adjust to inflation. Therefore, several papers (Fischer and Duncan, 2020; Tabbush, 2018; Schmidek and Weeks, 2005) suggested performing sensitivity analyses of ROI calculations (the next step).

Tahon *et al.* (2013) emphasised that scenario analysis and sensitivity analysis are important extensions to financial calculations (step 14, Perform risk/sensitivity analyses). Two relevant theories for these steps that they brought forward were real options theory and game theory. The first can deal with potential future outcomes of current day investments. Real option analysis implements future flexibility benefits in NPV calculations. "*Extending the underlying business cases with the value of options would offer new insight into the dynamic interplay between options and games*" (Tahon *et al.*, 2013). Game theory can help to analyse the impact of competition and can be used as an extension of the standard techno-economic analysis to study more realistic settings that include the impact of uncertainty. In addition, Den Dulk *et al.* (2010) suggested institutional theory as relevant for this step, because it "*emphasises the institutional pressures that influence organisations to respond similarly to their environments*" (p. 158). They claimed that the weights that organisations assign to costs and benefits in these types of analyses depend on these pressures.

Regarding step 16 (Prioritise and decide), it was brought forward that decision making and prioritisation is done by people with diverse backgrounds and who are vulnerable to potential outside influences (Einhorn *et al.*, 2020). In that light, Salzmann *et al.* (2005) mentioned the managerial opportunism hypothesis that states that decision makers might exploit opportunities in their own interest. Additionally, they suggested using the theory of cognitive framing**,** which indicates that people tend to make decisions based on whether options cause positive or negative associations for them. Similarly, agency theory was put forward by Siegrist *et al.* (2020) to show the importance of incentives and self-interest in steering the eventual decision making after the BC has been performed. "*Problems will arise when firms inadvertently create systems which incentivise managers and employees to act in ways that do not maximise shareholder value.*" (Siegrist *et al.*, 2020). More in general, Hahn *et al.* (2014) introduced cognitive categorisation theory to explain how managers make sense of the main topic of the BC. In very complex situations, people's "*cognitive processing becomes schema-driven*" (p. 5). They explained that managers are unable to oversee the full strategic

situation due to bounded rationality, and therefore develop subjective representations of the information inside the BC.

Phase 3: implement and sustain. Two theories in one paper from the sustainability field could enrich step 17 (Communicate implementation). First signalling theory was proposed, because it focuses on communication between people (Siegrist *et al.*, 2020). As pointed out, it could help deal with asymmetric information between a business and its wider stakeholders through proactive approaches to reduce that. In that same context, they also introduced legitimacy theory, which "*posits that corporate disclosures are made as reactions to environmental factors and in order to legitimise corporate actions*." (Guthrie and Parker, 1989).

Regarding steps 18–20 on further monitoring and (re-)evaluation of the BC, no explicit theories were mentioned. However, some papers referred to different strategic approaches that shaped the way BCs were addressed in this phase. Kos *et al.* (2008) introduced the total quality management approach, which is coined in the idea of continuous improvements of operations and processes at all levels of an organisation to achieve long-term success and customer satisfaction. It asks for a structured process of on-going refinements in response to continuous feedback, like these final steps incorporate. Marnewick and Einhorn (2019) mentioned that review and benefit tracking "*could be used to guide the project throughout ongoing decision-making*" (p. 8).

Besides theories for the three BC phases and their specific sub-steps, a few papers suggested theories for the flow/process of going through all the steps of a BC. Those four theories are all a type of process theory. Process theory in general is a hypothesis about a causal sequence of events (Pentland, 1999) that lead to certain outcomes after starting at an initial position (Einhorn *et al.*, 2019). It is considered a system of ideas that explains how an entity changes and develops (Wikipedia). Using a process theory approach, Einhorn *et al.* (2019, 2020) identified their process steps that are needed to use an IT related BC effectively. The (collection of) input(s) of each process step may be outputs of earlier processes and should lead to the execution of certain activities towards outputs and outcomes. Rodrigues *et al.* (2018) labelled this same approach "logic models" also known as the theory of change. The process of going through each BC step is not necessarily a straightforward line as suggested in the previous section. Therefore Jonker *et al.* (2017) introduced systems thinking (also called complex systems theory), as it could be used to describe the complex interactions and patterns between the different steps. Last, Rodrigues *et al.* (2018) also referred to system dynamics and stated that this is an application of control theory.

Discussion and implications

The variety of the topics/fields where BC analyses are applied shows the widespread need to understand the BC process better, both in theory and in practice. Although the review also identified a few main current fields that apparently have a high interest in improving organisational efficiency (IT, sustainability and health) or the need for a well-argued proof that internal spending are/can be valuable investments. Despite that their research on the setup of BC processes started in the early 90s of the twentieth century, this review has shown that it has only recently really picked up pace. The novel inter-disciplinary overview created in this paper is important for further maturation of BC process research towards supporting optimal organisational efficiency and effectiveness in decision making. Up till now, most academic BC studies started with describing which steps to take and then applying them, without basing their BC process steps on previous studies. Their processes and steps were largely based on anecdotal expertise of the authors or on standards in practice.

This systematic review extracted 20 common sub-steps and three main phases of a BC from 37 different academic studies, providing a ready BC process method to apply by everybody; both in academia and in practice. The integration of the steps for a full BC process

from multiple disciplinary fields into one overall BC process method can accelerate future BC research, which can now immediately dive into more in-depth research on certain steps or apply this method in fields that are less familiar with BC analysis. For practitioners, the 20-step method provides a clear overview to set up their own BC project for specific problems. With it, they do not have to reinvent the wheel, trust commercially available tools (which might be biased), or work with published approaches from specific disciplinary fields that do not fit well in their own context. Moreover, this generic representation of phases and steps in BC process can be seen as a helpful reminder about the need for proper preparation and evaluation of the BC as well as the need to take a broader view towards the impact that a certain intervention might cause.

Besides the 20-steps method, an important novelty of this paper is the identification of 29 theories and/or management approaches that can make a BC process more effective and successful. This adds to general theory-building for further research on BC processes. A few of these theories and approaches were aimed at the overall flow of a BC process, but most were related to benefit specific steps in more detail (see Table 3 for an overview). The review showed that the following steps of the BC process might be more developed than others: step 2 (conducting needs assessment, 4 theories), step 7 (identifying stakeholders, 2 theories), step 8 (exploring interrelationships, 6 theories), step 14 (performing ris/sensitivity analysis, 3 theories), step 16 (prioritising and deciding, 4 theories), and step 17 (communicating implementation, 2 theories). These steps are all related in some way to important decisions that have to be made during the development of a BC report and the management of a proper BC process. For example, they regard the decision of what to include, who to regard as impacted by the intervention, how these components create a complex system of relationships, which then need to be prioritised and communicated in some way.

So far, it seems that particularly phase 3 of the BC process about its implementation and communication has not received much theoretical attention yet at all. Besides the mentioned signalling and legitimacy theory to help in communicating the implementation process, perhaps project management, communication and evaluation theories could be valuable to further develop this phase as well in future studies. Regarding the other two BC process phases, the reviewed papers made no suggestions for theories to enrich the steps from phase 1 on problem structuring and identifying alternatives at the beginning of this phase, nor for internal resources and timelines to finalise this phase. It would be interesting to apply existing theories on problem structuring and on project management to these steps. An important step at the beginning of phase 2, step 12 on appraisal of benefits, was also ignored from a theoretical point of view so far. While this seems the essential heart of a BC in more tacit and complex interventions in the organisation, also here further research is recommended. Last, it seems likely that additional theories on decision making can benefit BC processes further. Some other steps that lacked theoretical underpinning (1. prepare to start, 3. determine strategic fit, 15. build a report) seem a bit more case specific. So, there might not be generic theories to support them, but rather certain (project management) tools could be useful to apply in future studies and in practice.

The overview of the theories that did come forward from this review clearly shows the importance of more emphasis on the "human component" of a BC process, besides the regular calculations that a BC generally is associated with. Looking at the main assumptions of the suggested theories, this human component might determine the outcomes of such calculations for organisational effectiveness and competitiveness even more than the calculation itself. They appear to suggest that, unless managed carefully, the BC process might not lead up to more effective and efficient business processes by itself. This paper therefore provides practitioners with the valuable insight that they need to carefully manage their decision makers and their cognitive processes of dealing with the outcomes of the BC calculations (in phase 2). The right considerations and strategic thinking might bring more than direct financial returns through

indirect benefits to the organisation. In addition, further application of these theories to academic BC (process) research can provide valuable insights in how to make sure that the right information is used for calculations and that they are interpreted and communicated in alignment with the organisation's strategy, mission and vision. Only then, one is really able to manage a complete and effective BC process and thus improve organisational competitiveness. So far, every theory has been applied to the BC process in only a few papers.

The identified theories are also likely to alleviate the main challenges of creating an effective BC in practice. Its assumptions can thus help practitioners improve their BC approaches. According to Björklund and Forslund (2019), the most important challenges of making a proper BC are: the inclusion of a wide range of indicators, the ability to measure, quantify and integrate different dimensions, and to include trade-offs, influence from stakeholders, a time perspective and contextual considerations. The identified theories seem applicable to shed more light on how all of these challenges should be managed in practice. For the inclusion of indicators and the ability to measure and quantify them, the theories of steps 2, 6 and 7 appear very relevant. Integrating the many dimensions and dealing with trade-offs and stakeholders could be studied through the lenses of the theories from steps 9 and 16, while the time perspective and contextual considerations can be enriched with the theories from step 11 and 14.

Like any study, this systematic review has its limitations. A review is as good as its selection of keywords. Although the search logic was developed through multiple iterations, some synonyms of keywords might have been missed. A quite generically used term as "business case" leads to tens of thousands of publications that were not relevant for this research, and thus was not an option. Other potential limitations relate to selection bias and consistency. The initial list of publications contained over two thousand papers and was compiled by the second author, thus the selection process was spread throughout a period of time which might have affected the selection of certain publications. In the following steps, both authors performed the screening, limiting further selection bias. For consistency reasons, both authors discussed all selected and discarded papers together. Another limitation is that the review is focused on papers that applied a certain theory or made a none/less-specific model/framework of steps/components for a BC. The longlist contained many more papers that discussed a BC analysis in different steps, but they were discarded because these lists of steps were very specific for the case that was studied. Further research of these papers could validate whether the 20-step method is indeed complete and/or whether certain fields might require a specific additional step somewhere in between. In addition, a different review approach using Artificial Intelligence (AI) to analyse the big data from the longlists of more detailed and specific BCs, might provide additional novel insights.

Conclusions

This systematic review has contributed to existing literature on BC analysis by its inter-disciplinary review of how BC processes are set up in different fields and which theories have been applied to it so far. Through an overarching analysis of existing knowledge, it has provided well-supported insights in what a BC is (definition), which steps should be included to go through an effective BC process, and which theories could help strengthen the theoretical foundation of BC development. As the step-by-step method is developed from works from different fields, it should be applicable for BC research in those fields that have supplied most of the evidence for this review (e.g. on the topics of sustainability, health and IT), but most likely also in fields that have not produced (much) BC related research yet. Overall, the authors feel that this review has made a valuable contribution to academic BC research by proposing a novel BC process method and discussing the state of theoretical knowledge development on BC analysis. For practitioners, the 20-step method demonstrates a wider view to the BC and provides a clear approach to composing their BCs for any change that they might need to consider.

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Appendix 1

Paper #	Authors	Year
2	Walker K., Yu X., Zhang Z.	2020
8	Williams T., Vo H., Bourne M., Bourne P., Cooke-Davies T., Kirkham R., Masterton G., Quattrone P., Valette J.	2020
11	Fischer H.R., Duncan S.D.	2020
14	Einhorn F., Meredith J., Marnewick C.	2020
21	Sasse-Werhahn L.F., Bachmann C., Habisch A.	2020
23	Riley D., Schaafsma M., Marin-Moreno H., Minshull T.A.	2020
27	Siegrist M., Bowman G., Mervine E., Southam C.	2020
33	Zaitsev N., Dror S.	2020
35	Eisman A.B., Kilbourne A.M., Dopp A.R., Saldana L., Eisenberg D.	2020
41	Einhorn F., Marnewick C., Meredith J.	2019
48	Linton M.-J., Coast J., Williams I., Copping J., Owen-Smith A.	2019
53	Björklund M., Forslund H.	2019
54	Volden G.H.	2019
55	Bishop D.	2019
60	Velenturf A.P.M., Jopson J.S.	2019
62	Ssegawa J.K.	2019
63	Schaltegger S., Hörisch J., Freeman R.E.	2019
71	Schaltegger S., Burritt R.	2018
78	Rodrigues V.P., Pigosso D.C.A., Andersen J.W., McAloone T.C.	2018
80	Presley A., Meade L.M.	2018
81	Tabbush V.	2018
82	Watson K.J.	2018
83	Lee G.	2018
95	Quashie M., Bouffard F., Joós G.	2017
97	Jonker W., Brent A.C., Musango J.K., de Kock I.	2017
115	Bartlett-Ellis R.J., Embree J.L., Ellis K.G.	2015
119	Zadeh R., Sadatsafavi H., Xue R.	2015
121	Pronk N.P., Baase C., Noyce J., Stevens D.E.	2015
127	Tahon M., Verbrugge S., Willis P.J., Botham P., Colle D., Pickavet M., Demeester P.	2014
130	Berghout E., Tan C.-W.	2013
132	Probert D., Dissel M., Farrukh C., Mortara L., Thorn V., Phaal R.	2013
148	Eckartz S., Katsma C., Daneva M.	2012
158	Shirey M.R.	2011
166	Gannon M.J., Smith N.J.	2011
171	Den Dulk L., Peters P., Poutsma E., Ligthart P.E.M.	2010
172	Carroll A.B., Shabana K.M.	2010
187	Kos K., Cullen N., Geiger A.	2008
191	Perencevich E.N., Stone P.W., Wright S.B., Carmeli Y., Fisman D.N., Cosgrove S.E.	2007
195	Reiter K.L., Kilpatrick K.E., Greene S.B., Lohr K.N., Leatherman S.	2007
203	Grosse S.D., Sotnikov S.V., Leatherman S., Curtis M.	2006
210	Salzmann O., Ionescu-Somers A.M., Steger U.	2005
216	Schmidek J.M., Weeks W.B.	2005
221	Robinson H.S., Carrillo P.M., Anumba C.J., Al-Ghassani A.M.	2004
228	Bailit M., Dyer M.B.	2004
230	Seeley P.A., Marklin R.W.	2003
249	Sarkis J., Liles D.H.	1995
257	Marnewick, C; Einhorn, F	2019
263	Nielsen, PA; Persson, JS	2017
265	Hahn, T; Preuss, L; Pinkse, J; Figge, F	2014
267	Ward, J; Daniel, E; Peppard, J	2008
286	Sabini L., Alderman N.	2021
290	Dayo-Olupona O., Genc B., Onifade M.	2020

Table A1. Paper ID of 52 selected studies for tables in this article

Table A2.
Terms for definition

Terms	# papers	Paper ID (see Appendix 1 for corresponding articles)
Document	6	62, 78, 148, 172, 257, 263
Organisation/organization/corporation	7	41, 78, 148, 148, 203, 228, 263
Justification/-ying or argument(s) or reasoning or rationale or evidence	20	14, 41, 48, 54, 55, 62, 71, 78, 80, 83, 95, 115, 148, 172, 187, 221, 228, 249, 257, 263
Project	13	14, 41, 55, 62, 80, 95, 115, 148, 166, 172, 187, 257, 263
Intervention or change or cause	9	11, 35, 48, 78, 83, 158, 187, 191, 216
Secure commitment, approval or support from management	8	14, 48, 55, 78, 83, 187, 257, 267
Investment/-ing	14	11, 14, 48, 62, 83, 95, 115, 172, 191, 203, 216, 228, 257, 263
Decision(s)	3	41, 71, 115
Resource(s) allocation	4	35, 48, 115, 187
Stakeholder	2	41, 55
Need	3	62, 115, 166
Understanding or informed	3	41, 48, 115
Cost(s) (management)	9	14, 35, 41, 54, 148, 158, 191, 257, 263
Expected benefit(s), results, outcomes (or value), objectives, goals	10	14, 41, 54, 62, 115, 148, 158, 187, 257, 263
Risk(s)	6	14, 41, 62, 148, 158, 257
Solution, options, alternatives	6	54, 62, 148, 158, 166, 257
Return on investment or economic (financial)	8	11, 35, 48, 115, 172, 191, 203, 216
Recommendations	2	158, 257
Specific	2	35, 95
Measure/-able, quantify/-able	3	35, 41, 62
Reasonable	3	11, 115, 191
Time frame	5	11, 14, 191, 216, 257
Review, monitor	2	41, 187, 257
Implementation	3	80, 148, 158

Appendix 3
Tables comparing steps/components in the different papers

Phase 1: Identify information and stakeholders

Paper ID	Total steps	Elements/Steps											
8	3	Identify											
60	6		strategic case (why action needed)										
216	6		clarify the question										
97	5				problem structuring								
81	6								perspective (who to include)				
230	5								identify stakeholders				
14 + 41+257	8	initial preparation	groundwork for BC										
249	5		system impact								transition impact		
95	5		drivers & business needs		preliminary & prefeasibility analysis								
82	6		mapping outcomes*						scope and key stakeholders*				
158	5		business needs and desired outcomes			preliminary options analysis							
166	4				market consortium*				stakeholder group*				
191	9		problem and hypothesis potential solutions						key administrators				
48	7		purpose	strategic priorities		options							
80	4		triple bottom line impacts				categories of metrics		stakeholders				
132	5		identify (what problems can it solve)						potential customers	customer needs			
187	6		business needs and proposed intervention				measurable objectives, benefits, success factors				process for introducing/managing recommended option, affected personnel, etc.*		
263	5		motivation and objectives				benefits, measures, and owners + structure benefits						
290						Determine possible alternatives	Determine criteria	Determine weights					
115	7		needs assessment	fit mission, vision, priorities								build team	intervention plan
33	5		desired outcomes (WHAT)		Importance, capability gap		indicators (HOW)				interrelationship matrix HOW-WHAT		

(*continued*)

Table A3.
Phase 1: identify information and stakeholders

121	7													metrics & measurement		shared values	shared vision		shared definition	
130	9		BC objectives		technological requirements		supplier options									stakeholders*				
148+267	6		business drivers and investment objectives											benefits measures objectives	structure benefits			organizational changes to achieve benefits		
55	7				define problem		solution	research concept	case studies									detail solution		
35	7				impact of context											perspective		study design	relevant decision makers	time horizon
23	8		problem and objectives				rough alternatives	constrain alternatives						identify & define criteria		stakeholders				
195	11		determine perspective		design the study*		describe the intervention											effects of intervention on quality*	effects capacity constraints*	time horizon*
228	10	Conditions of participation	Relevance to mission	impact on internal culture										alignment specific performance incentives		image, reputation	key stakeholders	strategic positioning		
221	14	Choose a business problem	current performance gaps	place problem in strategic context	clarify problem, identify initiatives to address it*			relationships initiatives, performance, objectives						measures towards objectives*				assess contribution	tools to implement	action plan and resources
62	19		need/ problem	strategic impact	situation analyses		objectives/ baseline solution	alternative solutions						measurement criteria + success factors + non-financial elements		stakeholders		assumptions + deliverables	dependencies + activities	time scale

Table A3.

Note(s): * order of this step was changed to original paper

Phase 2: Execute BC calculations

Paper ID	Total steps	Elements/Steps					
8	3	execute					
33	5	priorities, calculate required improvement levels					
80	4	impact					
35	7	costs	benefits				
132	5	jointly develop BC with the customer				present + negotiate next steps	
119	8	Plan - base decisions on evidence		Plan-evaluate decisions based on lifecycle cost			
121	7			ROI		communication	
115	7	financial analysis				build BC	
55	7	CBA analysis					decision point
14 + 41+257	8	assemble BC and present to stakeholders					prioritise against other projects + plan project and update
158	5	viable options (costs & benefits)		justification and recommendation			
166	4	project information forecast			project information consolidated		
249	5	costs and benefits		decision analysis			
263	5	costs & risks					Approve
290	5			construct decision matrix			determine preference order
82	6		evidencing outcomes + impact	SROI		reporting, using and embeddings	
97	5		causal loop modelling	dynamic modelling	scenario planning & modelling		
23	8			appraise alternatives against criteria	derive importance weighing for criteria	final ranking of alternatives	
48	7	costs	benefits		Risks		
95	5			techno-economic analysis	justification & benefit allocation	sensitivity analysis & investment management	
148+267	6	costs (& risks)	explicit value each benefit		(costs &) risks		
187	6	alternatives costs and trade-offs		startup funding, revenues/costs estimate (ROI)	milestones, accountabilities, and dependencies, risks and contingency plans		

Table A4.
Phase 2: execute BC calculations

(*continued*)

228	10	cost	reduced expenditure or costs	ROI							
230	5	forecast benefits and costs		weigh benefits and costs for different stakeholders		evaluate alternative work practices					
11	4	define costs		ROI	economic measures (CBA)	sensitivity analyses					
127	4			standard net present value analysis		identify uncertainties	identify flexibility	calculate option value			
130	9	costs	benefits			risk assessment*			project planning & governance*		
191	9	costs	financial or other benefits	financial impact					make the case for your BC		
221	14	costs and benefits		impact on business performance		probability of success					prioritize
60	6	appraisal of options, incl do nothing	benefits and dis-benefits	cost and investment appraisal		risks and impact			project delivery timescales and anticipated benefits		
62	19	cost	qualitative benefits/outcome	financial benefits (ROI)	dis-benefits	risks/constraint					
81	6	determine costs	estimate benefits	ROI	compare ROI to hurdle rate	sensitivity analysis					
195	11	cash flows		select a measure of ROI	discount rate	adjusting for inflation			organisational readiness		
216	6	costs	benefits	consider perspective	incorporate time	uncertainties					

Table A4.

Note(s): * order of this step was changed to original paper

Phase 3: Implement and sustain

Paper ID	Total steps	Steps/elements					
8	3	sustain					
97	5	implementation					
130	9		consolidation				
48	7		evaluations				
115	7	pilot intervention + evaluate outcomes					
121	7		leadership				
158	5		manage investment				
191	9		prospectively collect cost and outcome data once the program is in effect				
249	5		audit decision				
14 + 41 +257	8		monitor project	measure, assess benefits realization*		review BC*	
119	8	Act-communicate visions to all stakeholders during implementation	evaluate-monitor and document	Evaluate-quality metrics	React-analyze outcomes	Act-if any changes to original plan, reevaluate	React-translate outcomes to lifecycle costs and communicate back

Table A5.
Phase 3: implement and sustain

Note(s): * order of this step was changed to original paper