Appendix

Leveraging Process Data from ERP Systems for Sustainability Analyses

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Abstract. Sustainability is an increasingly important issue, which organizations need to take into account when assessing and improving their business processes. Doing so can contribute to enhancing an organisation's overall sustainability. *Green Business Process Management* is a line of research concerned with supporting organisations to integrate a sustainability perspective into their processes. However, existing approaches that assess sustainability on activity and process levels are often time-consuming and complex. Therefore, this work explores whether *Key Ecological Indicators* (KEIs) used to assess the sustainability of a business process can be calculated using data already available within an organisation. Following a case study methodology, we analyse nine real-world datasets extracted from a business process analysis system of a large enterprise software vendor. Results indicate that current data availability is insufficient for exact assessments. To overcome this issue and be able to derive insights about the sustainability of business processes with available data, we propose a conceptual model and provide recommendations for actions, based on the observations of the case study.

Key words: Sustainability, Green Business Process Management, Key Ecological Indicators, Process Data Analysis

1 Appendix

This appendix includes three tables. Table 1 outlines the complete search protocol and Table 2 and 3 present the results of two synonym searches that were performed. Thereby, synonyms were not only searched for the three final KEIs (*Energy Consumption and Emission, Material Use & Waste Generation*) used in the original paper, but for the six initial KEIs (*Energy Consumption, GHG Emissions, Emissions, CO2 Footprint and Material Use & Waste Generation*) identified in the literature depicted in Table 1 of the original paper from which the three final KEIs were derived. This was done to broaden the search and capture as many synonyms as possible. The first search focused on individual words within each KEI (e.g., *Energy* and *Consumption*), with results shown in Table 2. The second search targeted the compound terms (e.g., *Energy Consumption*), with results displayed in Table 3.

1.1 Search Protocol

Nr.	KEI	Code	Example	[#]
1	**Energy Consumption**	S1	"Energy"	29
2		S2	"Consumption"	62
3		S1 x S2	"Energy" x "Consumption"	0
4		S13	"Energy Consumption"	0
5	**Emissions**	S3	"Greenhouse"	0
6		S4	"Gas"	0
7		S5	"Emission"	30
8		S6	"Carbon"	0
9		S7	"Dioxide"	0
10		S8	"Footprint"	0
11		S3 x S4	"Greenhouse" x "Gas"	0
12		S3 x S4 x S5	"Greenhouse" x "Gas" x "Emission"	0
13		S6 x S7	"Carbon" x "Dioxide"	0
14		S6 x S7 x S8	"Carbon" x "Dioxide" x "Footprint"	0
15		S14	"Greenhouse Gas"	0
16		S15	"Greenhouse Gas Emission"	0
17		S16	"GHG Emission"	0
18		S17	"Carbon Dioxide"	0
19		S18	"Carbon Dioxide Footprint"	0
20		S19	"CO2 Footprint"	0
21	**Material Use & Waste Generation**	S9	"Material"	142
22		S10	"Use"	74
23		S11	"Waste"	4
24		S12	"Generation"	52
25		S9 x S10	"Material" x "Use"	2
26		S11 x S12	"Waste" x "Generation"	0
27		S20	"Material Use"	1
28		S21	"Waste Generation"	0

Table 1. Search Protocol

1.2 Synonyms

In both tables 2 and 3, the first column displays the KEI. The second column assigns each entry a unique identifier, representing all synonyms in that entry. For example, the code *S1* represents all synonyms *Energy, dynamism, electricity, heat, potential, service, strength and power*. The third column represents the term, for which synonyms were searched. The fourth and fifth column contain the synonyms found for the term respectively searched in [1] and [2].

KEI	Code	Term	Synonyms [1]	Synonyms [2]
Energy Consumption	S1	Energy	dynamism, electricity, heat, potential, service, strength	Power
	S2	Consumption	drinking, expenditure, utilization	using up, use, loss, waste, drain, consuming, expenditure, exhaustion, depletion, utilization, dissipation
Emissions	S3	Greenhouse	arboretum, conservatory, nursery	glasshouse, conservatory, hothouse
	S4	Gas	smoke, vapor	fumes, vapour, mist, fog, haze, smoke, breath, steam, fumes, dampness, miasma, exhalation
	S5	Emission	discharge, radiation	giving off, giving out, release, shedding, leak, radiation, discharge, transmission, venting, issue, diffusion, utterance, ejaculation, outflow, issuance, ejection, exhalation, emanation, exudation
	S6	Carbon	graphite, soot	-
	S7	Dioxide	-	-
	S8	Footprint	footstep, impression, imprint	impression, mark, track, trace, outline, imprint, indentation
Material Use & Waste Generation	S9	Material	cloth, component, element, equipment, goods, ingredient, machinery, object, stuff, substance, supply, textile	substance, body, matter, stuff, elements, constituents
	S10	Use	adopt, apply, employ, handle, manage, operate, practice, run, spend, utilize, wield, work	consume, go through, exhaust, spend, waste, get through, run through, deplete, squander, dissipate, expend, fritter away
	S11	Waste	debris, rubbish, scrap, trash	rubbish, refuse, debris, sweepings, scrap, litter, garbage, trash, leftovers, offal, dross, dregs, leavings, offscourings
	S12	Generation	bearing, breeding, formation, genesis, origination, procreation, propagation, reproduction	production, manufacture, manufacturing, creation, formation, origination, production, breeding, creation, formation, reproduction, genesis, propagation, begetting, procreation, origination, engenderment

Table 2. Synonyms for every word forming each KEI

KEI	Code	Term	Synonyms [1]	Synonyms [2]
Energy Consumption	S13	Energy Consumption	-	-
	S14	Greenhouse Gas	-	-
	S15	Greenhouse Gas Emissions	-	-
Emissions	S16	GHG Emission	-	-
	S17	Carbon Dioxide	carbonic acid, carbonic acid gas, CO2	-
	S18	Carbon Dioxide Footprint	-	-
	S19	CO2 Footprint	-	-
Material Use & Waste Generation	S20	Material Use	-	-
	S21	Waste Generation	-	-

Table 3. Synonyms for each compound KEI

References

[1] Dictionary.com (LLC). URL: https://www.thesaurus.com/ (visited on 08/21/2024).
[2] HarperCollins Publishers Limited. URL: https://www.collinsdictionary.com/dictionary/english-thesaurus (visited on 08/21/2024).