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Green Business Process Management

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Abstract: In the current scenario, preserving the environment has become a vital and critical area of discussion and requires a concrete steps and solutions to be implemented. Organizational strategies for saving energy are currently largely defined by three main courses of action: From a process organization perspective, efforts are being made to optimize processes and invest into more energy efficient infra- structure; from a behavioral perspective, one-time interventions such as energy campaigns or feedback mechanisms are common means to reduce environmental impact. However, both approaches face limitations concerning the scope of intervention. We conducted action-based research regarding energy optimization practices in Business Process Management (BPM). We discovered a lack of integrated approaches as regards fostering sustainability in organizations and deriving strategies for bridging the gap between strategic planning and everyday work in order to manage sustainability strategies more effectively and efficiently in BPM. We proposed the best organizational policies to be applied for preserving the environment and attain profit goals for the firms by going green in BPM.

Keywords: Green Business Process Management, Organizational Strategies, Action Based Research

1. Introduction

Green Business Process Management (BPM) focuses on the ecological impact of business processes. A sustainable business, or a green business, is an enterprise that has minimal negative impact or potentially a positive effect on the global or local environment, community, society, or economy—a business that strives to meet the triple bottom line. They cluster under different groupings and the whole is sometimes referred to as "green capitalism."[1] Often, sustainable businesses have progressive environmental and human rights policies. In general, business is described as green if it matches the following four criteria:[2]

1. It incorporates principles of sustainability into each of its business decisions.
2. It supplies environmentally friendly products or services that replace demand for non-green products and/or services.
3. It is greener than traditional competition.
4. It has made an enduring commitment to environmental principles in its business operations.

Energy is increasingly gaining importance as a critical factor to many businesses' success. Traditionally, due to its low costs and also out of the sheer inability to ac- count for energy consumption costs of single processes or products, energy costs have always been perceived as overhead costs. There was neither the urgent need nor any suitable tools for making energy consumption costs accountable. However, with increasing energy prices, businesses are seeking for the tools to change this situation and optimize resource consumption systematically. Organizations' typical countermeasures are closely connected to the advent of ubiquitous computing technologies and the rise of smart, networked organizations. In providing affordable technological means for tracking and making energy consumption accountable, digital measurement is key to introducing energy monitoring into controlling. Traditional approaches for the strategic optimization of organizations,

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such as Business Process Management (BPM) [1], were quick to adopt the new parameter into so-called Green BPM approaches. Classic BPM is typically characterized by a top-down approach and is often driven by external specialists. Therefore, criticism towards such conduct addresses the approaches' inherent structure, as measures are in danger of failing practicability for routines at operative level. In order to better address local workers as sources of energy consumption, one popular suggestion is to foster more sustainable work practices. Their effectiveness, however, is largely limited by organizationally defined processes. As a result, neither strategy makes use of the full potential of rendering an organization sustainable in terms of energy consumption). It is, therefore, an open research question as to how far there is potential to integrate both methods into a collaborative green business process management approach. Successful integration of local workers' expertise is expected not only to better motivate people involved in processes to alter their behavior with respect to energy consumption. It is also expected to uncover additional potentials to save energy in making use of workers' specific process knowledge. However, the suitable tools to inform stakeholders within a collaborative workshop on green business process management are unknown. Motivated by an ongoing case study, in this paper we outline possible strategies and tools for raising collective awareness and supporting the direct involvement of all stakeholders in the analysis and rearrangement of organizational work by introducing Collaborative GreenBPM (CGBPM).

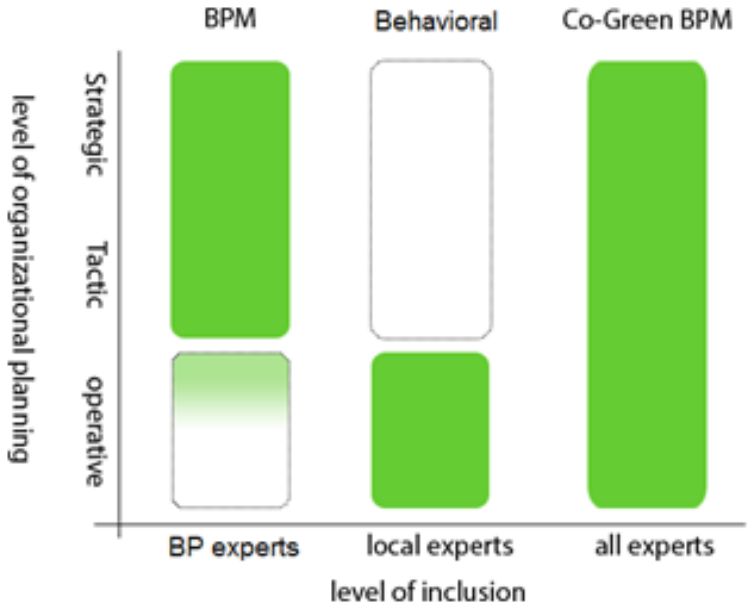

Fig. 1: Comparing the two dominant approaches increasing organizational sustainability and introducing GBPM.

Therefore show potentials of extending existing models which already take into ac- count environmental data for business process management with a collaborative approach. Referring to an ongoing case study, we outline prototypical tools and methods of moving from GreenBPM to Collaborative GreenBPM and outline a research agenda for supporting participants' views on energy consumption data when conducting collaborative workshops for business process management based on environmental data.

Sustainability is a business approach to creating long-term value by taking into consideration how a given organization operates in the ecological, social and economic environment. Sustainability is built on the assumption that developing such strategies fosters company longevity.

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2. Literature Review

The Harvard Business School business historian Geoffrey Jones (academic) has traced the historical origins of green business back to pioneering start-ups in organic food and wind and solar energy before World War 1[5]. Among large corporations, Ford Motor Company occupies an odd role in the story of sustainability. Ironically, founder Henry Ford was a pioneer in the sustainable business realm, experimenting with plant-based fuels during the days of the Model T[6]. Ford Motor Company also shipped the Model A truck in crates that then became the vehicle floorboards at the factory destination. This was a form of up cycling, retaining high quality in a closed-loop industrial cycle [7]. Furthermore, the original auto body was made of stronger-than-steel hemp composite. Today, of course, Fords aren't made of hemp nor do they run on the most sensible fuel. Currently, Ford's claim to eco-friendly fame is the use of seat fabric made from 100% post-industrial materials and renewable soy foam seat bases. Ford executives recently appointed the company's first senior vice president of sustainability, environment, and safety engineering. This position is responsible for establishing a long-range sustainability strategy and environmental policy. The person in this position will also help develop the products and processes necessary to satisfy both customers and society as a whole while working toward energy independence. It remains to be seen whether Ford will return to its founder's vision of a petroleum-free automobile, a vehicle powered by the remains of plant matter [8].

The automobile manufacturer Subaru is a sustainability giant. In 2008 a Subaru assembly plant in Lafayette became the first auto manufacturer to achieve zero landfill status when the plant implemented sustainable policies. The company successfully managed to implement a plan that increased refuse recycling to 99.8% [9]. In 2012, the corporation increased the reuse of Styrofoam by 9%. And from the year 2008 to the year 2012, environmental incidents and accidents reduced from 18 to 4[10].

Smaller companies such as Nature's Path, an organic cereal and snack making business, have also made significant sustainability gains in the 21st century. CEO Arran Stephens and his associates have ensured that the quickly growing company's products are produced without toxic farm chemicals. Furthermore, employees are constantly encouraged to find ways to reduce consumption. Sustainability is an essential part of corporate discussions [10]. Another example comes from Salt Spring Coffee, a company created in 1996 as a certified organic, fair trade, coffee producer [11]. In recent years they have become carbon neutral, lowering emissions by reducing long-range trucking and using bio-diesel in delivery trucks,[12] upgrading to energy efficient equipment and purchasing carbon offsets. The company claims to offer the first carbon neutral coffee sold in Canada [13] Salt Spring Coffee was recognized by the David Suzuki Foundation in the 2010 report *Doing Business in a New Climate* [13]. A third example comes from Korea, where rice husks are used as a nontoxic packaging for stereo components and other electronics. The same material is later recycled to make bricks [14].

In the luxury sector, in 2012, the group Kering developed the "Environmental Profit & Loss account" (EP&L) accounting method to track the progress of its sustainability goals, a strategy aligned with the UN Sustainable Development Goals [15]. In 2019, on a request from the President Emmanuel Macron, François-Henri Pinault, Chairman and CEO of the luxury group Kering, presented the Fashion Pact during the summit, an initiative signed by 32 fashion firms committing to concrete measures to reduce their environmental impact. By 2020, 60 firms joined the Fashion Pact [16]. In recent years, several design concepts and energy feedback systems inspired by these theories have emerged in the domestic context [17]. In addition to the differentiation between the theoretical foundations, approaches mainly differ on the levels of data gathering, data processing and data visualization. Due to the developments in smart metering technology, it has become possible to capture real-time consumption data disaggregated at device- or room-level to gain detailed under- standing of the consumption of specific devices [18]. Instead of visualizing raw consumption data, more and more data is processed and

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intelligently analyzed with smart algorithms to support the user with detailed feedback and treatment suggestions (e.g. automatic evaluation of consumption) [19]. The visualization of data and the feedback types employed vary widely, ranging from approaches using goal-setting and gamification to motivate the user to reach a specific goal [20] through conditioning feedback mechanisms that reward or punish users if the consumption is not sustainable [21] to interactive and context-aware feedback that links consumption data to additional data to make energy data more meaningful to the user [22].

As most studies focus on private households, there are only few experiences and guidelines available in organizational settings, with most of them relying on monetary incentive schemes. Evaluative studies suggest, however, that other factors such as design concepts of feedback may be of more relevance [23]. Following this, several best practices and guidelines for campaigns, largely in the context of public administration and companies alike have been created [24]. These typically focus on classic materials such as posters, flyers, information brochures and letters from superior authorities. They also offer some advice on how to use email and web-sites, but suggestions for using smart technologies are usual-ly not addressed in such toolboxes.

More recent research tries to make use of such existing ubiquitous sensing technologies in developing feedback solutions for organizations [25]. Looking at studies investigating and evaluating eco-feedback in organizations, there are fewer examples showing mixed results. According to Carrico and Riemer [25], even monthly feedback with a motivating message can provoke energy savings in a case study with university workers. Also in the context of a university, Murtagh et al. [26]'s study tested eco-feedback applications on employees' desk- tops, finding significant reductions of consumption. However, due to manifold work- and context-dependent restrictions, many studies notice a complex nexus of dependencies between feedback, organizational constraints and behavior, resulting in numerous reasons not to switch off.

Another problem which was identified is the long-term impact of measures, typically appearing as a one-time intervention. Until now, this phenomenon has only been addressed by very few studies. In summary, while some feedback mechanisms from research in domestic con- texts can successfully be adapted to organizational eco-feedback solutions, there are open challenges: Firstly, feedback systems effective in the long run are needed to embed more sustainable behavior into organizational routines. This in turn could reduce the costs of one-time interventions, at the same time supporting sustaining effects and learning about energy efficiency. Secondly, feedback fails to overcome formal organizational hurdles, thus leaving behind strategic inefficiencies. It is an open research question; how far combining the benefits of behavioral energy feedback for workers with common change management methods thus might hold the potential to increase the added value of measuring energy consumption in organizations when allowing behavioral change to further affect organizational process management.

3. Discussions/ Results

The optimization of organizational practices often is managed through business process management approaches. Literature contains very diverse approaches in context of business process management methods. These approaches are mostly organized in lifecycles that are repeated iteratively, to achieve a continuous improvement process (CIP).

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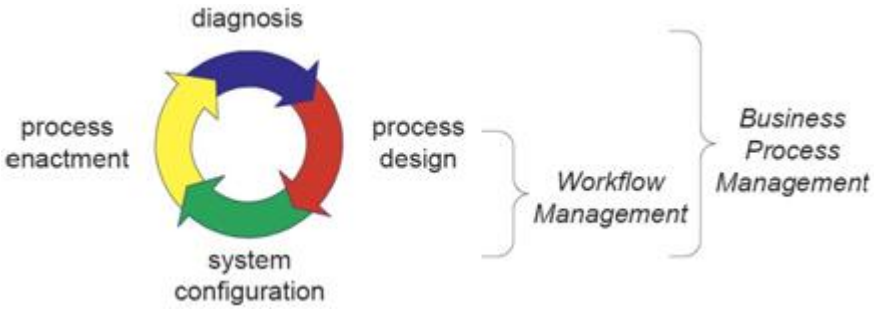

Fig. 2: BPM lifecycle [27]

In the process design phase, business processes are identified and designed/redesigned. The configuration phase includes configuration and selection of the system and implementation of first-phase designs. In the enactment phase, the configured systems are used to execute and monitor the operational business processes. Finally, during the diagnosis and evaluation phase, monitored information is analyzed to identify problems and to detect potential room for improvements. While this approach clearly focuses on the execution and monitoring of processes supported by a workflow engine, there are other approaches that place stronger emphasis on the phases of process analysis and process design.

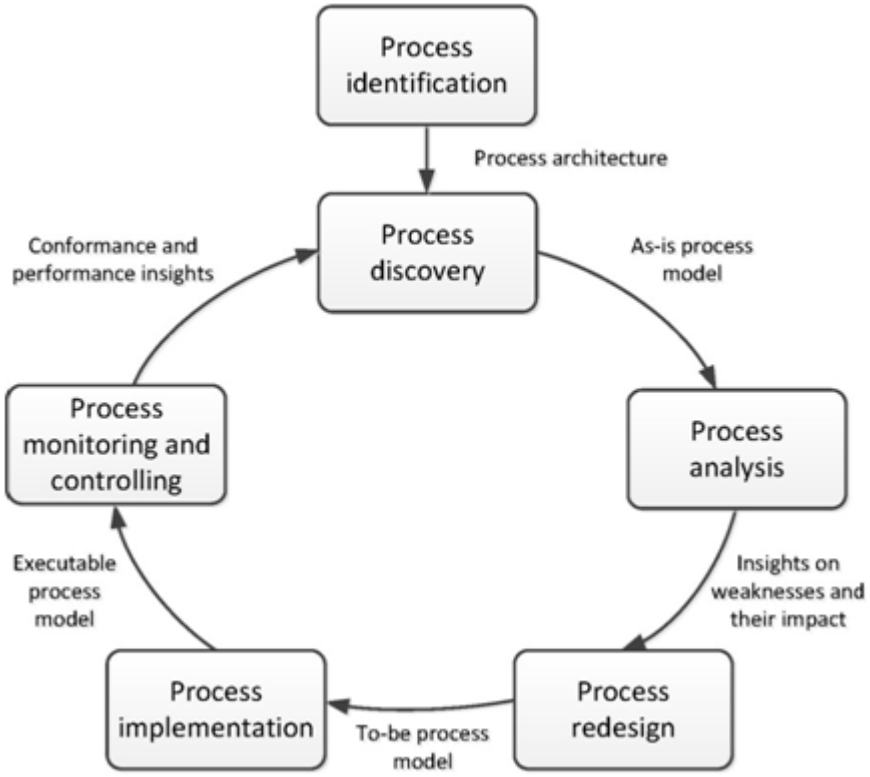

Fig. 3: BPM lifecycle [28]

This model is used to analyze the process in question, to identify problems and flaws. Afterwards, the process is re-designed in order to tackle the identified flaws before it is implemented. During implementation, it is monitored and the lifecycle is run again if necessary. Both the aforementioned lifecycles – as well as others – are based on the Deming cycle of plan [28]. Approaches within CGBPM commonly refer to this model as well. Therefore, in case of a holistic infra- structure for collecting and distributing environmental context data from processes, CGBPM can adopt and adapt to existing BPM tools, instead of reinventing the wheel.

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Fig. 4: GreenBPM model [29]

One major downside of all of the aforementioned lifecycles is that they are usually management-driven as a result of strategic planning. This means that they are mostly driven by a top-down approach in which stakeholders are only partially involved.This effect is reinforced by the fact that corresponding initiatives are often conducted by external consultants analyzing existing processes and designing them with respect to strategic goals. Consultants may gather information about the processes in question as well as their surroundings using a number of sources. These sources include, but are not limited to, analyzing existing process-documentation, running interviews with process stakeholders or analyzing the data output of software systems. Based upon the knowledge gathered, processes are then typically visualized using graphical modeling notations. These models then serve as a basis for process analyses and are subsequently altered by aforementioned consultants, aiming at attaining strategic goals set by management. It may be necessary to run multiple cycles until a sufficient stage for the model is reached. This model is then also used as a means to inform organizational change and thus to implement the process. During the analysis and design phase, individual workers only passively serve as a source of information about the process in question. However, during the organizational implementation phase afterwards, during which all the designed and developed processes will actually be brought to life, the individual workers are the ones who have to carry out the processes in the way they were designed [29]. Various strategies are used to ensure that people apply new process functions effectively and efficiently. These include: people changing management strategies to overcome the not-invented-here syndrome; set up training strategies to overcome knowledge deficits; and management and controlling strategies to verify whether the actual process is in line with the process designed.

In order to address the aforementioned limitations, different approaches have been created in recent years, which can be subsumed as collaborative modeling [30]. At the center of these approaches are workshop concepts, in which stakeholders - together with consultants - jointly develop models of processes, analyze them and discuss possible changes. These approaches allow for stakeholders to directly participate in process design, thus potentially increasing their motivation to adapt to process modifications afterwards and limiting possible misguided designs. Furthermore, these approaches also allow people to exchange perspectives within workshops, discuss alternatives and come up with a more sophisticated solution on which all stakeholders can agree. So far, however, they lack a discussion of how to appropriately support workers as well as management and external business process managers to take environmental data, such as energy consumption data, into account.

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During our interviews with several stakeholders, ranging from operative to strategic management, the need for tailored feedback according to individual roles and specific process knowledge as well as ways to make energy accountable become apparent. We then outline the challenges and benefits of Collaborative GreenBPM and present a preliminary set of tools for supporting collaborative process analysis and modeling.

In an ongoing case study within a metal working business, we are exploring possible support for the organizations' style of tracking, evaluating and using energy consumption data for more sustainable processes. While the former are themselves highly complex tasks and out of the scope of this contribution, we here focus on different workers' needs in terms of energy consumption data in order to gain the highest possible added value from the data available.

Based on an Action Research Methodology [31], we conducted a survey with different stakeholders within the companies. These included workers at operative level, employees explicitly concerned with existing energy management and parts of the companies' management. Our status quo analysis was aimed at understanding general organizational energy-management activities, as well as individual and role-based preconditions regarding the existing infrastructure, in addition to goals, needs and possible benefits for the internal energy management. As a result of our research and in close cooperation with the company, we developed an integrated energy management concept that consisted of the major areas hardware, software and processes. The key of the concept includes a measuring sensor system which allows the energy consumption of e.g. the machinery to be monitored. This is already partially realized in practice (e.g. one subsidiary was equipped with sensor technology) Data is stored in a central real-time database system to allow the precise evaluation of the energy consumed in the production process. We additionally plan to roll out our concept to other sites and partners both from the retail industry and from financial institutes to make the approach more robust.

Throughout the process of accompanying the organization on their way to making choices regarding hardware, software and infrastructure, we also gained insights on the data preferred to better understand energy consumption from each individual's perspective.

Taking the aforementioned empirical findings and existing approaches for process improvement into account, we envision Co-Green BPM as being an approach that ties together individual energy feedback with mechanisms of collaborative modeling. This approach should make use of existing business process management tools, which have proven effective to change organizational structures. Based on the identified gap regarding potentials of a joint approach integrating both process management and behavioral approaches for optimizing process sustainability, we envision a GBPM approach. We propose to allow process stakeholders to actively intervene in GreenBPM, thus aiming towards a more bottom-up and people-centered strategy that affects all phases of the lifecycle. Finally, we propose energy feedback to be linked to process models as those models can be seen as the central artifact for process analysis and (re-)design. Linking process steps to energy data using interfaces such as the ones described in the following section might provide a hint for tying abstract representations such as process models to real world data. This in turn might help process stakeholders who are not trained in using models to tie actual energy consumption to abstract representations of process steps in process models.

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Fig. 5: GBPM lifecycle based on classic understanding [31]

We have addressed the gap between green processes and green practices by combining environmental, psychological and organizational theories. We presented GBPM as a conceptual framework to bridge the gap, taking into account work practices as well as strategic process improvement. We further outlined the key challenges of how environmental data should be included into a CGBPM in order to enable stakeholders to make sense of data, provide group awareness for energy consumption and actively include them into process management, thus tapping the full sustainability potential in organizations. While we do acknowledge that there is work on collaborative modeling as well as on Green BPM still to be done, we think that the combination of both approaches in GBPM the way is novel and extends existing methods in multiple ways: GBPM is not limited to processes that are carried out and con- trolled by using workflow engines. It rather explicitly aims at any process in which collaboration takes place, thus explicitly taking organizational change into account. Co-Green BPM includes continuous awareness and feedback mechanisms which do not only serve as a means to assess the current state of energy consumption but that may also be used to trigger process assessments as mentioned before. GBPM does not aim towards reinventing BPM but rather at altering existing approaches in order to tap their full potential, organizations may even build upon established strategies.

4. Conclusion

A business going green makes customers feel that it is a trustworthy business. Word-of-mouth is the most valuable form of advertising and green businesses can't buy that kind of publicity. This not only bolsters a company's existing market base but extends it people who may never have heard of that company may pay attention to one that believes in being eco-friendly. GBPM also have large Impact on Employee Morale Employees feel safer working for green businesses. Involving workers in company-wide green initiatives boosts morale. Employees feel that their health is cared for and they aren't simply expendable commodities. This is also a good way to reduce turnover, because employees don't want to leave a place that makes them feel as if they are a part of a work community that cares. By demonstrating a commitment to a healthy world environment, firms can prove they care about their employees' world as well, which is beneficial for employee morale. Green has become the Status Symbol for internationally known companies and encouraging following the Green BPM lifecycle in their processes.

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