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Principals and Suggestions for Sustainable Materials Management within Facility Management

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ABSTRACT

Background and aim – Many countries signed the Paris Agreement to mitigate global average temperature rise. In this context, Dutch government decided to realize a reduction of 50% using resources and raw materials in 2030. This paper explores how practice-based research into facility operations can contribute to this aim.
Methods / Methodology – Practice-based research which includes direct observations, desk research, and participatory action research.
Results – This explorative research presents principles and suggestions for facility managers and procurement managers on how they can embed sustainable materials management in the organisation and how to take control of waste. The proposed suggestions are derived from practice-based research and presented as topics of attention for facility professionals.
Originality – Within education of Dutch universities of applied sciences and daily professional facility practices, the phenomenon of materials management is underexposed. To contribute to the national and international climate objectives, (future) facility professionals need better support to reduce waste. Bachelor students were involved throughout this research. This approach gave refreshing insights into waste at the end of the supply chain (control separation units) that can improve informed decision-making at the beginning of the supply chain.
Practical or social implications – Facility management professionals have an important role to play in the mitigation of global average temperature rise, because of their leading role in procurement, service operations, and materials management. However, they struggle to find sustainable solutions. This paper seeks to inspire professionals with interventions that have proven effectiveness on the reduction of waste.
Type of paper – Short research paper.

KEYWORDS
Circularity, Facility Management, Materials Management, Procurement, Sustainability, Supply Chain Management.

INTRODUCTION
Climate change is a global emergency that requires immediate action: the Paris Agreement has been signed by many countries to tackle this emerging problem. In 2016 the Dutch government have launched a government-wide programme called “Nederland Circulair in 2050” to mitigate a quick transition towards a Circular Economy. The Dutch strategy is to realize a reduction of 50% of using primary resources and raw materials by 2030 as a stepping stone towards 2050 and to align the Netherlands with the ambitions of other countries (Rijksoverheid, 2016, p.7). With Dutch government

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playing an exemplary role towards businesses and consumers, they started the transition towards a Circular Economy by setting the goal to produce merely 35% residual waste within their business operations by the year 2020. Gradually it appeared harder to achieve these goals than initially suspected and many of these goals have yet to be accomplished (PBL, 2021). The delay in achieving these goals can (partially) be explained by the behaviour of the parties involved, the inconsistencies in ownership of these goals, and the lack of control on (sustainable) materials management within their business operations. A consequence is that the reduction of residual waste and the more efficient exploitation of materials remains a big challenge. Leaving Dutch government and facility professionals in particular with the question how they can change their business operations in such a way that they can meet the goals set for 2030 and onwards (Rijksoverheid, 2016).

With this paper we explore how facility operations can contribute to the Dutch strategy of 2030, with an explicit focus on sustainable materials management (SMM), and we investigate what is needed to incorporate SMM within organisations. In other words: *how can facility operations contribute to the sustainability goals of the Dutch government with the help of SMM?* For the purpose of this paper, we apply the definition of The Organization for Economic Cooperation and Development (OECD) in terms of SMM. SMM can be defined as "an approach to promote sustainable materials use, integrating actions targeted at reducing negative environmental impacts and preserving natural capital throughout the life-cycle of materials, taking into account economic efficiency and social equity" (Khorasanizadeh, 2018, p.18-19). Facility operations are focused on supporting the primary processes within organisations (Mobach, 2015, p.1). A facility department engages in facility services (cleaning, catering), housing (construction, maintenance), and procurement (tender, contract management). With the current pre-supposed lack of control on (sustainable) materials management within business operations and the potential of proper SMM with regards to reductions, facility professionals can become vital players in achieving the goals set by the Dutch government.

This paper is part of a two-year practice related research project which focuses on creating an action protocol for facility professionals to empower them to optimize the circularity of their business operations. The research project is funded by Regieorgaan SIA in cooperation with three consortium partners: Custodial Institutions Agency, FM Haaglanden, and The Hague University of Applied Sciences (THUAS), all in the Netherlands. This paper is organized in four sections, i) the theoretical framework, ii) the research methodology, iii) results and findings (case study THUAS), and iv) conclusion.

THEORETICAL FRAMEWORK

Before exploring the research methodology and the results we need to further elaborate on two questions: 1) How can facility operations contribute to the sustainability goals of the Dutch government? 2) Why use a SMM approach to enable facility operations in meeting these goals?

Sustainable Facility Management

In essence and in the sense of NEN 15221-1, Facility Management (FM) consists of two main tasks: 1) to deliver services which support and sustain the operations and activities of organisations and their staff and 2) to manage resources, work environments, and support services (Chotipanich, 2004, p.365, Pelzeter, 2013, p.1). Currently, with an urgent demand for more sustainable activities, new emerging technologies and following the ISO 41001 requirements, FM can transform into sustainable facility management (SFM) (Alfalah, 2020, p.1). SFM may be regarded as a new perspective which offers FM with vast opportunities to reduce the negative impact of organisations and staff on the environment. According to Alfalah (2020, p.1), SFM also includes materials management and the use of sustainable materials. As the goals set by the Dutch government are primarily focused on reducing primary

resources and raw materials within their business operations, SFM is pre-eminently suitable for meeting these goals. Hence, with this case study we investigate if SFM can be applied within THUAS.

Sustainable Material Management

The basic principles of SMM are: i) use materials in the most productive way with an emphasis on using less, ii) reduce toxic chemicals and environmental impact throughout the material life cycle and iii) assure we have sufficient resources to meet today's needs and those of the future (EPA, 2022). With SMM one can incorporate a systematic approach to promote sustainable materials usage and reduce the usage of (raw) materials. By gaining control of material flows and integrating actions targeted at reducing negative environmental impacts and preserving natural capital throughout the life-cycle of materials, more sustainable materials can be used. All whilst taking into account economic efficiency and social equity (Khorasanizadeh, 2018, p.18-19). As facility managers need more and more information in order to make capable decisions and manage their business (Twynstra Gudde, 2019) and material flows, SMM is an ideal method to enable SFM in meeting their information needs. Which is particularly helpful with information becoming such a vital factor within the business process (Steinau, 2017, p.2681). Therefore, in this study we explored the applicability and relevance of SMM within THUAS by investigating the current situation at THUAS through conducting interviews with different stakeholders. Additionally, we deviated from the general acknowledged path of big digitalized data and have embraced counting and weighing waste to explore its relevance as an important source of information for the effectiveness of procurement, service operations, and materials management.

For this study we investigated the applicability of SFM and SMM within THUAS by looking at the current situation within our case study. we studied how the principles of SFM and SMM are currently incorporated within the business operations of THUAS and give suggestions on how to embed SFM and SMM even further if needed. With the priority on: i) reducing the negative impact on the environment by ii) using materials in the most productive way and using less whilst iii) assuring we have sufficient materials to meet today's needs and those of the future.

RESEARCH METHODOLOGY

The current explorative study is a practice-based study, meaning we aim for positive impact on society in general (Candy, 2006, p.3) and professional practice in particular. In this study, we focus on reducing the use of primary resources and raw materials and on waste reduction. We used a mixed methods design in which we merged quantitative and qualitative data to provide a comprehensive analysis of the research question. Both types of data were collected at roughly the same time (Creswell, 2014, p.268). The majority of the research was conducted in cooperation with Bachelor students of different programs such as facility management, industrial design engineering, and information technology.

With our experiments we focused primarily on the supply chain: from procurement until waste production. We have investigated the following topics of the supply chain: i) the initial phase of procurement where we examined the role of contract and supplier management and how the reduction of various materials is incorporated within contracts; ii) the operational phase, where we studied the data infrastructure for managing material flows, and the cleaning process of collaborating partners; iii) the end of the supply chain where we studied the waste disposal by conducting control separation experiments on the different waste flows.

As this involves a process with many stakeholders, we implemented different types of experiments and data collection tools to get the most comprehensive result. First we collected data through interviewing different stakeholders. The interviews can be categorized in: 1) interviews with procurement- and contract managers regarding the initial phase of procurement, in total the students interviewed 13

respondents; 2) interviews with facility professionals regarding the operational phase, in particular to establish whether or not there is a data infrastructure in place to manage the material flows. In total the students interviewed 23 respondents; 3) interviews with the waste collector company, in total the students interviewed 3 respondents. All interviews were conducted using a semi-structured approach and were analyzed using open and axial data coding. Secondly, we collected data by conducting control separation experiments. During two periods we collected the waste which was produced within two locations of THUAS and manually post separated the waste into different fractions. We collected the waste during the period of i) the 18th of May until 15th of June '21 at the school of facility management and ii) during the 28th of June until the 2th of July '21 at the cafeteria area of THUAS. The waste has been fully and manually examined and separated. The reason for conducting this final experiment is because we expect that many organisations, our case study included, use this information as a reference point for managing and arranging their business operations.

RESULTS

As SFM and SMM requires an integrated approach we have collected data throughout the entire supply chain with regards to materials management. By doing so, we investigated the entire material cycle. We started with the waste production at THUAS by employees and students, and from there we investigated the entire circle. Starting with the procurement phase.

Procurement phase

In our case study, procurement- and contract managers reported an absence of a clear contract policy with regards to sustainable guidelines for procurement. Secondly, respondents stated that there are a large number of employees who are authorized to place orders. In addition, the responsibility of sustainable procurement is not clearly assigned, leading to an inconsistency in ownership when it comes to sustainable procurement. Furthermore, we determined that there is no suitable data infrastructure in place to manage the different material flows. Which appears to be the case throughout the entire supply chain. As a base principle of SMM is to use less materials and use materials in the most productive way, a clear contract policy with sustainable guidelines, a product owner of the policy, and a suitable data infrastructure are essential in order to incorporate SMM properly.

Operational phase

Respondents reported that most of the material flows are unregistered during the operational phase. Which results in a business process which was based upon routines and not upon using materials and resources in the most productive way. It starts at the arrival of products at the expedition area all the way up to the waste production. For example, when suppliers deliver their products at the expedition area, in most cases with additional packaging, there is an absence of appropriate registration of the materials. Another example is at the moment a product turns into waste and ends up in trash bins. Respondents mention that trash bins are often half-empty when collected due to pre-fixed schedules. With a lack of control on the fill level and content of the trash bins, it is difficult to deviate from the current work routine and start using materials more productively, whilst at the same time, taking in account the different needs of the occupants, in line with the principles of SFM and SMM. By implementing a proper data infrastructure to monitor the different material flows, this can be by monitoring filling levels of trash bins or by registering additional packaging at the expedition area, the business process can be optimized to use less materials and eventually reduce the negative impact on the environment.

End phase

During the end phase we investigated the data which is currently used as a basis for making management decisions with regards to material management, waste creation, and disposal. In the

operational phase we established that there are no proper data registrations during the operational phase. By interviewing respondents, we established that facility professionals use data of their waste collector company to monitor the different (raw) material flows which run through their business operations. Waste collector companies hand over monthly specified overviews of the amount of collected waste. FM receives overviews of the different waste flows, which are sub-divided into, among others: i) plastic, metal, and drink-cartons (PMD), ii) paper, iii) organic waste, iv) coffee cups, and v) residual waste. This division is used by facility professionals to monitor their current sustainable objectives and to adjust, if deemed necessary.

We conducted control separation experiments to validate this data stream. By doing so , we found discrepancy between the overview provided by the waste collector company and the actual situation. By manually separating the different waste fractions, we found that all waste fractions were polluted. None of them fully contained the materials that belonged to that particular waste stream. For example, during the first period of ex-post separating waste, we established that only 60 percent of the PMD could be classified as PMD. With SFM and SMM it's important to have a validated data infrastructure to gain the most optimal result. As facility professionals use this data flow as primary source to monitor their (raw) material flows, it's important to assure the accuracy of the data stream.

CONCLUSIONS

With this study we have investigated how facility operations, and SFM and SMM in particular, can contribute to the sustainability goals set by the Dutch government for 2030. As it is the Dutch strategy to realize a reduction of 50% of the use of raw materials in 2030, SFM and SMM are an organizational solution in meeting these goals. SFM focusses on reducing the use of materials and its impact on the environment via waste reduction and the use of more sustainable materials. Whereas SMM focusses on using materials in the most productive way and reducing the use of materials in general. SMM is highly needed in order the meet the goals set by the Dutch government. Furthermore, with SFM and SMM we assure that the focus isn't merely on reducing the usage of materials. But that we also ensure that we have sufficient materials to meet today's needs and those of the future. By doing so, and by investigating all phases of the supply chain, procurement phase, operation phase, and end phase, we can give the following suggestions to (re)assure a proper implementation of a SFM and SMM policy: i) in the procurement phase it is important to establish a clear contract policy focused on sustainability including a policy owner. ii) In the operations phase, and the entire supply chain in general, is important to have a proper data infrastructure in which one can register and monitor the materials. By doing so, the business process can be optimized to use less materials. And iii) finally from the end phase we can conclude that it is important to work with validated data. Especially in a situation where the data registration is limited. To summarize, for SFM and SMM to assist organizations in meeting the goals of the Dutch government, it is important to have a clear contract policy focused on sustainability embedded throughout the entire business operations and to have a proper data infrastructure for managing and validating materials flows.

DISCUSSION AND LIMITATIONS

In this current case study, most of the data is gathered via semi-structured interviews with experts and stakeholders. However, this case study is part of a larger study into SMM in order to develop a guideline for SFM. The emergent question is how SMM and SFM should be incorporated in ISO 41001 and NEN 15221. We believe that a standardized focus via norms will accelerate SMM and SFM to achieve the highly needed cut of raw materials for 2030 and a full circular business operation by 2050. This question can be addressed in further research via inter alia surveys with professionals and cross referencing with other similar knowledge institutes and studies. Time is running out!

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