Discovering Core Modules of Platform-based Software Ecosystems for Non-Profit Sport Organizations

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Abstract. Non-profit sport organizations fulfill an important role in society but face various problems regarding the attraction, retention and management of members and volunteers. Digitalization in the form of platform-based software ecosystems is a promising alternative to costly tailor-made or inflexible standard-software. Such ecosystems for sport organizations are challenging to build, mainly since research and knowledge is sparse regarding which core modules and functionalities are important as well as the influence of organizational characteristics, such as size or setup, on platform requirements. In this study, we present relevant modules and functionalities derived from literature and available standard software. Subsequently, we conducted an indepth Kano analysis with 532 participants from non-profit sport organizations in order to evaluate the identified modules and functionalities. Our research helps to understand the relevance of individual modules and functionalities for platform-based software ecosystems and outlines how organizational characteristics influence the results.

Keywords: Non-profit sport organizations, Platform-based software ecosystems, Kano model, Core modules, Organizational characteristics.

1 Introduction

Non-profit organizations (NPO) in Germany take an important role in society. Encompassing more than 2.600.000 listed and unlisted clubs and foundations [1], they provide an eminent foundation for social cohesion. However, in recent years, the economic pressure on NPOs such as (sports) clubs or (charity) foundations has increased, due to legal hurdles and the competition from the non-profit (e.g. new trends and clubs) and the private sector (e.g. fitness studios and applications) [2, 3]. Further, non-profit sport organizations (NPSO) differ from NPOs through the focus on (physical) activities and the goals they pursue, such as offering sport to society, communicating values and bringing people together which poses specific requirements. NPSOs primarily rely on voluntary work to handle responsibilities such as membership administration, facility and financial management [4]. Hence, the attraction, retention, as well as the reliability of volunteers is essential for the existence of NPSOs [5, 6].

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Simultaneously, the landscape of NPSOs is diverse regarding their organizational characteristics like size, position or demographic distribution of volunteers and members, which further aggravates these challenges. NPSOs may increase the engagement of employees, members and volunteers by providing useful and easy to use information systems that improve and simplify their daily work [7]. Digitalization has a significant potential for increasing productivity and comfort of daily tasks while reducing costs [8]. However, NPOs in general limp behind with regards to digitalization in comparison with commercial companies [9].

With respect to software solutions, NPSOs have to decide to use either standard or tailor-made software [10]. While standard software lacks flexibility in catering to the specifications of smaller NPSOs, tailor-made software is costly and difficult to develop [10]. Platform-based software ecosystems enable NPSOs to access a collection of standard modules to configure an individualized system for various use-cases. Compared to tailor-made software, a software ecosystem offers a collection of standard modules have to be developed [11], e.g. by following a tailor-made approach. As such, platform-based software ecosystems allow for a process of value co-creation between NPSOs through the reuse of existing standard solutions while hosting tailor-made solutions using the same platform.

The ability to leverage digital assets from a network of NPSOs prevents organizations from spending time and money on the development of commodity solutions. When designing a platform ecosystem for NPSOs, it is inevitable to analyze the requirements of employees and volunteers regarding modules and functionalities. A platform for end-users with a very limited amount of resources to spend on individual adjustments needs to incorporate a certain set of modules to boost platform adoption [12]. As we are not aware of previous research on this, with this study, we aim to provide insights into the requirements of platform-based software ecosystems for NPSOs. Furthermore, this study makes a theoretical contribution by achieving detailed understanding of the interplay between modules and functionalities required by NPSOs in different constellations and by showing how different contextual factors influence these relationships. This study is part of a larger project on the development of a platform-based software ecosystem for NPSOs which follows the design science research (DSR) paradigm and aims to answer the following research question:

"What core modules and corresponding functionalities are most relevant for end-users of platform-based software ecosystems considering different organizational characteristics of non-profit sport organizations?"

We report the results of a Kano study with 532 participants from German NPSOs. The Kano method provides an optimal fit for our research endeavor due to its possibility of ranking and classifying characteristics in favor of importance for users [13]. Our results shed light on the relevance of 36 functions in nine modules for platform-based software ecosystems for NPSOs. Furthermore, we analyze effects of organizations' size as well as the position of participants.

2 Theoretical Foundation & Related Work

2.1 Platforms and Platform-based Software Ecosystems

Platforms are defined as a "product or service that serves as a foundation on which outside parties can build complementary products or services" [14]. Digital platforms are software-based systems with a core code base on which different contributors can add further code for extending their functionality [15]. Relying on the fundament of modular systems technology, a platform-based software ecosystem consists of the platform itself providing basic functionalities and of apps which add supplementary functionalities to the ecosystem [12, 14]. Platform-based software ecosystems have been researched in a wide range of perspectives. Following the modular systems theory, modularity is a key concept for platform-based ecosystems and decreases the "module-to-platform systems integration costs" [14]. Furthermore, the competition between user groups was subject to research resulting in the description of different strategies for competing on such platforms [16].

Regarding prescriptive knowledge on platforms, little research has been conducted to assist with design decisions towards the development of platforms. Recent work by [17] has provided several design principles for online communities in platform-based software ecosystems. Furthermore, to provide a broad picture on platform research, some studies are analyzing the development of eHealth [18] and a neighborhood platform for elderly people [19]. These user groups have, similar to this case, specific needs and requirements such as different physical conditions, which have to be managed. The findings of those studies demonstrate the necessity of supporting different user groups.

2.2 Platforms for Non-Profit Sport Organizations

NPSOs differ from other NPO forms in terms of the goals they pursue such as providing affordable sports courses to society, communicating values, e.g. fair play, tolerance and encourage gender quality and in terms of focus, such as the provision of sportive activities [20]. NPSOs use their income exclusively to cover their costs for personnel, premises, events, etc. and are not profit-oriented. Organizationally, NPSOs are independent from the government and administrate themselves [21]. In order to cover their cost, NPSOs raise a membership or admission fee as main income and are often depended on donations or other sources of support. Revenues are required to fulfill the entire depth of administration like personnel, trainers, equipment, sport facilities, taxes and insurance [22]. NPSOs are constantly confronted with very specific and unique problems. Problems may be of financial nature, but also relate to legal aspects, to the attraction, binding and the reliability of individuals, to keeping facilities in a good condition and to the competition with commercial providers and other NPOs [6, 23]. Especially being reliant on volunteers is an important topic, since many NPSO positions are filled by voluntary workers e.g. board members or treasurers. Therefore, it is crucial for the success of the association to motivate members to contribute time and effort [24].

Multiple studies have been conducted analyzing various aspects of NPSOs, e.g. [5, 25, 26]. Few studies have been focusing on the development and classification of websites for non-profit organizations [27, 28]. Loosely connected to this work's topic, [11] have investigated a governance strategy for non-profit platforms for refugees. By doing so they were able to increase the societal impact of the platform in action. However, to the best of our knowledge, no investigation into the design and impact of platform-based software ecosystems in the specific environment of NPSOs and their unique organizational characteristics and requirements has been conducted so far.

3 Research Methodology

This article is part of a larger project which applies DSR methodology to develop design principles for a platform-based software ecosystem for NPSOs. Therein, the focus of this study lies in the identification of core modules and corresponding functionalities of such platforms for NPSOs. Pursuing this goal, we apply a two-step research approach, displayed in Figure 1.



Figure 1. Two-step research methodology.

In the first step, relevant module categories and their corresponding functionalities for a NPSO were identified. Since there exists no universally accepted framework for modules of platform-based software ecosystems, we conducted a narrative literature screening [29] of research on platform-based software ecosystems, following the search strategy described by [30]. To complete the identification process, we conducted a competitor analysis of 25 commercially available NPSO software systems¹. We determined modules and functionalities which were established and determined in the respective literature and market research and iteratively aggregated them into discrete categories, following the method of [31]. Finally, this procedure resulted in nine module categories, comprising 36 functionalities, which were unambiguously adhering to respective modules. The attribution to the results is displayed in Table 1.

As a second step, we developed a quantitative questionnaire based on the Kano model [32]. The Kano model originates in user research and is a widely applied method in service engineering [33] and scientific studies [33–35]. It is used to identify and rank customer requirements leading to products and services that satisfy the customers' needs and contribute to a delighted customer group. Based on the theory of attractive quality [36], the model assumes that features create an individual degree of satisfaction. System

¹ The set of identified software systems is available under the following link: https://osf.io/msuwq/?view_only=85bfa68e648840788c07bfe95782ddfa

features can be classified into six categories, based on the level of satisfaction: (M) Must-be, representing features whose absence would dissatisfy the user and that are taken for granted by the user; (A) Attractive (or nice to have) features, which represent an additional benefit not perceived as necessary that can attract users; (O) Onedimensional features are explicitly required by users and show a linear, positive relationship with user satisfaction; (I) Indifferent features have no impact on the user albeit they are present or not; (R) Reverse features, whose presence decreases user satisfaction and should be avoided and (Q) Questionable features indicating an incomprehensible wording that should be reconsidered [32, 34]. Participants answer two questions, a functional one, assuming that a feature is available, and a dysfunctional one, assuming that a feature is not available [13]. Corresponding answers are mapped on a 5-point semi-quantitative scale representing the extent of satisfaction or dissatisfaction. The results are then mapped onto the Kano matrix [13], as shown in Figure 2. Following the Kano method, category (Q) is excluded from the analysis in the following and (R) functionalities are flipped over and ranked again using the functional question as the dysfunctional question and vice versa [13]. The resulting Kano model categories (A), (M), (I) and (O) can be mapped onto a graphical representation. Values for both satisfaction and dissatisfaction are calculated based on the number of modules to the respective clusters by the following formulas [13]:

Satisfaction: (A + O)/(A + O + M + I) Dissatisfaction: (O + M)/(A + O + M + I)

In our case, every functionality of a module of platform-based software ecosystems represented a feature in the Kano model, while modules, in turn, were a collection of several functionalities. Thereby, we were able to allocate every functionality to one dedicated category of the Kano model. Based on those results, through the aggregation of the corresponding functionalities, modules were mapped to one category as well.



Figure 2. Kano diagram and Kano evaluation matrix ([13], p.5-6).

To ensure data quality, we followed the instructions from [13] who provide a detailed methodological description on how to perform the Kano study, which by its structure phrases questions both positive and negative, thus assuring a natural quality gate. To collect relevant information, the Kano questionnaire was developed in a digital form and sent out to three regional gymnastics associations which forwarded it to their containing 8434 sport clubs. The Kano questionnaire structure consisted of three parts relating to the functionalities and modules whereby each functionality was measured due to their positive and negative appearance, relating to the non-functional aspects of software and,

thirdly, relating to demographics which were asked in the beginning. The clubs forwarded the questionnaire to their members and 532 participants answered the questionnaire. As we lack information on the number of members reached, we cannot calculate an exact response rate. Target group for the survey were members who worked as volunteers or had part- or full-time jobs at the sports club. Regular, passive members were excluded from the survey before calculating results. We further collected metadata of size of sports organizations, position within sports organizations, time of membership, gender and age.

4 Results

4.1 Modules and Functionalities

We identified a total of nine modules that contain 36 distinct functionalities. The Event module (I) enables event management, e.g. organization of training sessions or participants' attendance sheets. The Accounting module (II) supports the financial management, such as billing of membership fees to keep an overview of incoming and outgoing payments. The Technology module (III) enables users to improve and adjust software by themselves, such as importing and exporting associations' data or customize software solutions. The License module (IV) includes the management of coaches' licenses and the duration of licenses, e.g. through 'Automated expiration warnings'. The Honoring module (V) enables to manage the honors for members in order to keep (voluntary) employees motivated, e.g. by 'Providing a history of honors'. The *Reporting module (VI)* supports business analysis and reporting of key performance measures, e.g. by 'Visualizing revenue streams'. The Knowledge module (VII) maintains access to important documents and knowledge management, e.g. by 'Sharing of templates'. The Channel module (VIII) represents the internal and external communication services, e.g. a 'Chat service' or a 'Social media connection'. Finally, the Committee module (IX) enables pooling of members into committees and manages the assignment of responsibilities. Modules and functionalities are listed in Table 1.

Table 1. Modules and functionalities of platform	n-based software ecosystems for NPSOs.
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Modules	Functionalities	Source
Event (I)	(1) Management of participants, (2) Integrated resumes of participants, (3) Session calendar, (4) Participants sheets, (5) Registration of participation	Competitive analysis
Accounting (II)	(6) Automatic billing, (7) Reminder mechanism, (8) Donation receipt, (9) Double- entry accounting, (10) Management of debit notes, (11) Exclusion of members	Competitive analysis
Technology (III)	(12) Individual adaption of software, (13) Interface to other systems, (14) Import and export of data, (15) Using web-version in browser, (16) Local version on own device	[37, 38], Competitive analysis
License (IV)	(17) Overview over licenses, (18) Warning for license expiration, (19) Planning examinations of coaches	Competitive analysis
Honoring (V)	(20) Manage honors of members, (21) Possibility of honoring, (22) Automatic updates of honors states, (23) History of honors for members	Competitive analysis
Reporting (VI)	(24) Data analysis in real-time, (25) Overview over revenue streams, (26) Overview over members in courses, (27) Information through data analysis	[37–41], Competitive analysis
Knowledge (VII)	(28) Document administration, (29) Sharing of materials	[42], Competitive analysis

Channel (VIII)	(30) Chat services, (31) Sending newsletter, (32) Analysis of newsletter, (33) Social- media connection, (34) Live-updates of competitions	[38], Competitive analysis
Committee (IX)	(35) Building of committees, (36) Managing committees	Competitive analysis

4.2 Results of Kano Analysis

The average age of the 532 survey participants was 50.35 years (SD: 12.73, 43.43% female) with a distribution on gender of 43.43% female, 56.57% male and 0% diverse participants. 35.76% of the answers came from board members, while the survey was answered by 23.17% sport representatives and 27.99% operational positions. Regular passive members with no explicit position in an organization were removed from the evaluation (13.08%). With respect to the size of a club, most participants worked at medium-sized clubs (251-1000 members, 54.35%), followed by large clubs (>1001 members, 35.47%) and small clubs (<250 members, 10.19%)².

The distribution into NPSO sizes was excelled following previous work by [25]. In the following, we will report the results of the general analysis of the data, without filtering for specific positions or organization sizes, as shown in Figure 3. Five of the nine modules fall into the **Indifferent Cluster** (55.6%), which is the largest cluster in terms of quantity. The **Must-be** cluster holds two modules (22.2%), the *Technology* and *Honoring modules*. The remaining two clusters, **Attractive** and **One-dimensional**, hold one module each, *Reporting* (11.1%) and *License* (11.1%), respectively.



² Besides modules and functionalities, we analyzed non-functional requirements, as well as all results on the level of meta-data categories (age, gender, experience). Results can be provided on request to the first author.

Figure 3. General results of the Kano analysis of all modules and corresponding functionalities. Colors show the affiliation with the different clusters: Attractive – Green, One-dimensional – Blue, Must-be – Red, Indifferent – Black.

Focusing on the individual functionalities, the Attractive cluster includes five functionalities (13.9%). The functionalities belong to five different modules and as such add various aspects to a platform, of which the A-cluster is the second smallest of all clusters in terms of included functionalities. The smallest cluster is the Onedimensional cluster, holding only two functionalities (5.5%) from the Honoring and the Licensing module, hence also relating to quite distinct aspects of the platform. However, we see that despite both functionalities, namely (18: 'Warning before license expires') and (23: 'History of honors for a member'), fall into the One-dimensional cluster, the dissatisfaction value for both functionalities is bordering neighboring clusters (18: -0.52, 23: -0,54). Furthermore, the satisfaction value of (23) is on the borderline to the M-cluster (0.51). Continuing clockwise, the **Must-be cluster** holds 15 functionalities (41.7%), containing functionalities from all modules except the *Committee module*. Most functionalities stem from the *Event*, *Accounting* and *Honoring* modules (3 functionalities each). We observe that most functionalities are clustered quite densely, while two functionalities distinguish themselves from the larger groups due to their lower dissatisfaction values (6: 0.76, 14: -0.75). Lastly, the Indifferent cluster holds the remaining 14 functionalities (28.9%). These stem primarily from the Channel module (4, 28.6%), with other dominant modules being Accounting (2, 14.3%), Technology (2, 14.3%) and Committee (2, 14.3%). As such, both functionalities of the Committee module fall into the Indifferent cluster. Furthermore, we analyzed the results for organizational characteristics filtering for the size of and position of members within NPSOs. Table 2 documents how the results change when accounting for these two characteristics.

Table 2. Descriptive results of the Kano analysis for NPSOs with regards to the functionalities of size and member position in the respective cluster.						
Cluster	>1001	250-1000	<250	Board members	Operational	Sport

Cluster	>1001	250-1000	<250	Board members	Operational positions	Sport representatives
A-cluster	10, 27.8%	5, 13.9%	1, 2.8%	4, 11.1%	8, 22.2%	7, 19,4%
O-cluster	6, 16.7%	3, 8.3%	0,0%	1, 2.8%	0,0%	3, 8.3%
M-cluster	12, 33.3%	12, 33.3%	8, 22.2%	15, 41.7%	13, 36,1%	11, 30.6%
I-cluster	8, 22.2%	16, 44.4%	27, 75%	16, 44.4%	15, 41.7%	15, 41.7%
Total	36, 100%	36, 100%	36, 100%	36, 100%	36, 100%	36, 100%



Figure 4. Kano analysis of functionalities distributed according to the size of NPSOs with >1001 members, 250-1000 members and <250 members.

When analyzing the clustering of functionalities according to NPSO size, we observe differences especially when comparing large- (L) and medium- (M) sized with small (S) NPSOs, as shown in Figure 4. In the Attractive cluster, larger clubs identified double the number of attractive functionalities (L: 10), than did medium (M: 5) or small organizations (S: 1). The same holds for the One-dimensional cluster, where large NPSOs attribute twice as many functionalities to (L: 6), compared to mediumsized NPSOs (M: 3). For the Must-be cluster, the distribution of functionalities shows the highest similarity between sizes of all four clusters (L: 12, M: 12, S: 8). For the Indifferent cluster, the chart draws a quite contrasting picture. Much more functionalities are attributed to this cluster by small (S: 27) than by medium (M: 16) or large NPSOs (L: 8). This difference is especially striking for large and small NPSOs, with small ones perceiving more than three times more functionalities as indifferent (Δ : 19, 337.5%). Finally, when controlling for the position of participants in NPSOs, we observe only small differences between groups, as shown in Figure 5. The distribution across positions - board members, operational positions and sport representatives - is within a narrow range for the Must-be cluster (30.6%, 36.1%, 38.9%) and the Indifferent cluster (41.7%, 41.7%, 44.4%). For the Attractive cluster, differences are visible between board members (11.1%) and operational positions and sport representatives (19.4%, 22.2%). Differences between ratings of members with different positions are most prominent for the One-dimensional cluster. While board members and operational positions attribute zero to one functionality (0%, 2.8%) to this cluster, sport representatives attribute a total of four functionalities to be onedimensional (8.3%), hence explicitly requesting these functionalities.



Figure 5. Kano analysis of functionalities distributed according to position within NPSOs with board members, operational positions, sport representatives (e.g. coaches, referees).

5 Discussion

This study provides insights into the requirements of NPSOs for a platform-based software ecosystem. We applied a two-step research approach to identify relevant core modules through an initial literature screening and market research, followed by an in-depth evaluation of relevant modules and functionalities with 532 real users. We identified differences in how modules and corresponding functionalities are perceived by NPSOs with regards to organizational characteristics, e.g. to varying size and participants' position within a NPSO.

First and foremost, our results underline the need for a platform-based software ecosystem for NPSOs. NPSOs face very specific challenges, like the retention of members, the competition with gyms, other NPSOs and with fitness apps (e.g. freelethics). Our initial analysis (step one) revealed the broad range of modules relevant for NPSOs when designing a platform-based software ecosystem. Additionally, our results from step two indicate how the requirements of NPSOs regarding modules and specific functionalities differ with regards to organizational characteristics. Sport clubs require a mix of specific functionalities, even independent of their size (e.g. small or large NPSOs), rather than being forced to select from a predefined collection of modules. Consequently, functional requirements are diverse, which goes hand in hand with the diverse landscape of problems. Therefore, we provide evidence that NPSOs must select from a broad range of modules and functionalities which results in a selection problem due to limited resources. Diving deeper into organizations' characteristics, the data shows different manifestations of characteristics' demand for different solutions. The results outline the need for a

generalizable solution, which still allows for individual adjustment while not creating massive overhead in cost and effort as a result of the heterogeneity of the NPSO landscape. A platform-based solution provides an optimal foundation to target these requirements for all kinds of NPSOs.

The overall distribution of the nine system modules reveals that only the Technology and the Honoring module (23.22% of all modules) are a must for the participants, while it is indifferent about five modules (55.56%). This constellation indicates that only a small set of modules is necessary in order to execute core activities in many NPSOs. Of the remaining two modules within the Kano categories, the License *module* shows potential for great satisfaction if available, labeled as 'Attractive'. The Knowledge module, on the other hand, labeled as 'One-dimensional', may lead to a linear increment of customer satisfaction. Nevertheless, we assess that making suggestions based on modules has limitations since the distributions might differ between categories and functionalities. Therefore, it is worthwhile to consider rather the layer of functionalities than the module layer and to carefully assess differences of functionalities between characteristics, when providing recommendations about module prioritization for specific scenarios. Diving deeper into the individual functionalities, the results provide a clear distinction between highly relevant functionality clusters, represented as 'Must-be's, additional specials (A) and most of the functionalities which are clustered as 'Indifferent' (1). Only few functionalities are assigned to the 'One-Dimensional' sector. We observe that participants are indifferent about less than half of the functionalities for NPSOs (34.4%) while the rest is in the clusters (M) and (A) (65.6%), ergo directly relevant for the system users. As essential must, the results reveal very basic functionalities like a 'Session planer' (3), 'Registration of participants' (5), a 'Reminder mechanism' (7), the 'Import and export of data' (14), 'Managing honors of members' (20) or the 'Document administration' (28). All of those represent basic functionalities of the respective modules: Event (I), Technology (III), License (V), Honoring (VI) and Knowledge (VIII). Hence, we assume that the 'Must-be' modules, *Technology* and *Honoring*, might be expanded by a set of further basic functionalities of the other modules. Remarkably, functionalities like the 'Use of social media' or 'Live updates from competitions' are regarded as 'Indifferent' (I). In contrast, private companies with fitness applications rely heavily on the opportunities of such channels. This might be an indicator for what NPSOs are able to improve in order to increase their attractiveness.

As second core constituent of this study, we discuss the effect of organizational characteristics on the requirements of NPSOs. While for small NPSOs most functionalities are perceived to be in the 'Indifferent' cluster (27, 75%), for large NPSOs the biggest cluster in terms of contained functionalities is the 'Must-be' cluster (12, 33.3%). This symbols a stronger opinion about different functionalities expressed by the users within larger NPSOs. In the case of small-sized NPSOs we have a few core functionalities, which are musts for a club to exist while participants are indifferent about most of the functionalities. One explanation may be that small NPSOs do only require a certain set of core functionalities, especially when

considering their sparse resources. Alternatively, it is possible that users already deal in sufficient detail with solving the few existing tasks with the existing functionalities or that they are insecure about how some of the presented functionalities may solve their problems, indicating a need for better guidance.

However, considering the two remaining categories of the medium-sized and large clubs, it becomes apparent that the number of required functionalities increases slightly, but the number of indifferent functionalities decreases substantially. Furthermore, the attractive modules, which are not a prerequisite but offer added value, are highly appreciated in numbers. Also, the quantity of one-dimensional features increases further. These results show us that larger NPSOs still get along with few functionalities but are aware of the benefits that additional functionalities can provide. Considering the different positions of NPSOs it emerges that there are thoroughly varying views among the positions as to which functionalities and modules are of interest. While the functionalities of the (M) and (I) cluster are relatively stable in terms of quantity, the (A) and (O) cluster differ between the sport representatives, board members and operational positions.

The following example highlights the differences between NPSOs. The *management of member honors* (20) functionality shows interesting differences when accounting for the size of the clubs. While it is a value-adding feature (O-Cluster) for large NPSOs, small-sized NPSOs do not consider this feature, since they must focus on core functionalities, which member honoring is no part of. To comprehend the analysis, our results indicate that it is important to provide different sets of modules or at least varying functionalities within the modules for different NPSO positions and sizes on a platform-based software ecosystem. A possible solution might be self-customization in order to solve the different challenges of the involved parties. Such self-customization might allow to address the individual requirements while simultaneously representing an actionable approach for a platform solution for a range of diverse NPSOs with different organizational characteristics. It becomes evident that with regards to the organizational characteristics of NPSOs, no one-size-fits-all approach will be successful to meet the requirements which again underlines the applicability and relevance of platform-based software ecosystems.

This study contributes several insights to the body of knowledge. First, it provides an answer to the research question of how to support software developers who build a modularized system for NPSOs with insights about core modules and corresponding functionalities. With this work, it is possible to provide platforms with core modules and additional functionalities targeting the demands of NPSOs. Secondly, by applying the Kano method reaching over 530 real users we were able to achieve a high degree of user-involvement which validates our results. Finally, our results give broad insights into the landscape of NPSOs, which is diverse and simultaneously important for society to the mentioned reasons. The results lay the foundation for the development and evaluation of a platform-based software ecosystem to address the problems of NPSOs in subsequent research cycles.

Although we have endeavored to pursue high and rigorous standards within our research work, some limitations to our results apply: Despite the fact that we were

able to involve a high number of real users in our analysis, the results of the Kano study are subject to temporal instability [34], as users might decide differently today than they will do tomorrow. A repetition of this study at a later point in time, possibly while evaluating a prototype of a concrete software ecosystem, can help to account for these effects. However, this limitation of temporal instability cannot be excluded entirely when conducting questionnaires. Furthermore, we conducted this study with real users of gymnastic associations as representatives for NPSOs. NPSOs, though, represent other sport associations as well, which depicts a second limitation of this study. Therefore, it may be beneficial for the generalizability of our data and to deepen our understanding to conduct a study with a similar design targeting more subgroups, different types of NPSOs and different users.

Regarding future work, this study is part of a larger project about the development of a digital platform for NPSOs, designed as a DSR project. It represents the awareness of the problem section and serves as a collection of needs. The findings allow us to derive design principles for the development of such platforms based upon the thorough discussion of this work. The diversity of results and the in-depth knowledge we obtained through the survey will be used to implement specific characteristics like self-customization features and dedicated solutions for NPSOs. Subsequently, we will develop a prototype and validate it in a field study. With this approach, a holistic platform-based software ecosystem can be created that enables NPSOs to improve their internal processes and make them more efficient. This allows them to ensure that their members, employees and volunteers are more satisfied, to stand up to the ever-increasing competition from the private sector and to better support their members as well as society and its cohesion.

6 Conclusion

NPSOs provide rich value for society but face major challenges. They may benefit substantially from a comprehensive digital foundation for their work in the form of a platform-based software ecosystem. This study utilizes a Kano analysis to uncover knowledge about needs and requirements in the form of an evaluation of a set of modules and corresponding functionalities with 532 end-users. This method allowed us to gain profound insights into the processes and needs of NPSO members. We were able to extract that the *Technology* and *Honoring* modules enriched by basic functionalities of other modules provide an adequate foundation for sport clubs. Regarding the diversity of NPSOs, a key for success is a more individual but no tailor-made software solution, which a self-customization alternative might provide. These findings will be used in the future to develop a platform-based software ecosystem for improved management of NPSOs and enhanced member support. In this way, we hope to facilitate the interaction of NPSOs on the one hand and on the other - looking at the important role of NPSOs in Germany - to strengthen the cohesion of society.

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