HRIS Design Characteristics: Towards a General Research Framework

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Abstract. *Design characteristics constitute a promising approach for supporting researchers and practitioners in developing, implementing and improving Human Resource Information Systems (HRIS) to ensure the anticipated benefit for those firms which introduce and/or apply them. Constituting an intuitively appealing approach, the question how to understand and apply systematically such design characteristics is of specific interest. Hence, the paper proposes a general research framework of HRIS design characteristics which a) allows researchers to understand and apply crucial aspects relevant to HRIS design characteristics better so that b) practitioners may be supported in developing, implementing and permanently improving successful HRIS.*

Keywords: HRIS Design Characteristics, HRIS Development, HRIS Implementation, HRIS Improvement.

1 Introduction

Human Resource Information Systems (HRIS) can be understood as "configurations of different interacting systems that aim at generating and delivering [Human Resource] HR functionality in order to automate and informate [Human Resource Management] HRM [63]. With a view to HR core functions, these are, among others, recruiting and selection [7], compensation and benefits [15], training and development [66], performance management [44] as well as HR planning [23]. In so doing, HRIS show diverse benefits such as the improvement of HR operations and management processes by means of increased quality of decision making [4, 29, 36] or the improvement of "employee satisfaction by delivering HR services more quickly and accurately" [29].
However, the profit of applying HRIS strongly depends on their appropriate development, implementation and permanent improvement as only properly developed, implemented and permanently improved HRIS will ascertain the success [13, 29, 61].
On the other hand, this implies that HRIS success is manageable, at least, to a certain degree [64]. In so doing, design characteristics relevant to the success of HRIS may

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support HRIS-related decision makers, system developers as well as system implementers in ascertaining the success of HRIS. Being of special importance, HRIS design characteristics are understood as a set of properties inherent to HRIS [28] by which they can be developed, implemented and permanently improved [13, 29, 61] and which are conceptually assumed or empirically ascertained to have a positive impact on system success [9, 11, 12, 46, 70, 71, 76]. To be more concrete, HRIS design characteristics may help HRIS-related decision makers to better validate the capabilities of particular HRIS, and based on this, to better derive necessary improvement measures in order to warrant successful HRIS. Thus, by use of corresponding HRIS design characteristics, HRIS-related decision makers may be enabled to better detect in how far HRIS actually meet crucial aspects relevant to HRIS success [29, 61]. Besides, HRIS design characteristics may support system developers in the preparation of the final HRIS system specification, respectively help them to build or select successful HRIS based on this initial system specification [13, 29]. With a view to system implementers, design characteristics may help them to customize HRIS precisely according to the (internal/external) customers' requirements [13]. Given this, researchers may be predominantly interested in the derivation of as well as the engagement with HRIS design characteristics by means of rigorous foundations and methodologies so that they may better support the aforementioned stakeholders in the development, implementation and permanent improvement of successful HRIS [26].

However, only few research contributions explicitly deal with HRIS design characteristics by exploring [37, 45, 55, 68, 75], applying [1, 37, 38, 39, 52, 55, 68, 75, 76] or reviewing [45] diverse design characteristics at present. This may be mainly due to the fact that existing foundations such as the Technology Acceptance Model [8, 9, 10, 71, 72, 73] or the DeLone and McLean Model of IS Success [11, 12, 58] do not propose concrete guidelines how to understand and apply design characteristics relevant to the success of HRIS [11, 12, 46, 71, 73, 76].

Hence, our current understanding of HRIS design characteristics is quite limited at present and there is a necessity to suggest general insights. Given this, the main purpose of this paper is to introduce HRIS design characteristics as an emerging and mandatorily needed field of research in order to ensure the success of HRIS. However, due to its comprehensive and interdisciplinary character systematic engagement and debate around particular aspects relevant to HRIS design characteristics (e.g. definition of the application target, the method of elicitation, respectively evaluation of HRIS design characteristics) is needed in order to better guide and structure the upcoming discourse of this emerging field of research, and consequently, the successful selection and application of relevant HRIS design characteristics. Thus, the current paper does not intend to enumerate particular HRIS design characteristics but primarily aims at paving the way for HRIS design characteristics research in general by proposing a parsimonious, but general, research framework of particular aspects relevant to HRIS design characteristics. Using this framework, researchers should be enabled to better understand and apply crucial aspects relevant to HRIS design characteristics so that, subsequently, practitioners may be better supported in developing, implementing and improving successful HRIS.

In order to deal with these questions, the paper is structured as follows: based on a clarification of HRIS a general research framework of selected issues relevant to HRIS design characteristics in particular will be derived. Subsequently, the framework will be discussed and exemplarily illustrated by means of an ongoing HRIS research project. Thirdly, both practice and research-oriented implications will be derived.

2 A General Research Framework of HRIS Design Characteristics

At the current stage of research, a general research framework conflating particular aspects relevant to HRIS design characteristics is considered as the most appropriate to better guide and structure the upcoming discourse of this emerging field of research, and thus, the successful selection and application of relevant HRIS design characteristics. In short, the framework distinguishes between the following aspects relevant to HRIS design characteristics (see Table 1):

type of success measure relevant to	decision maker		system developer		system implementer		system user
type of design characteristic	system-related				information-related		
type of application target	development			implementation			improvement
validity	universal				contingent		
method of elicitation	theory	literature review	use case	case study	survey	[...]	combinatorial approaches
method of evaluation	non-empirical			empirical			combinatorial approaches
level of granularity	coarse-grained			medium-grained			fine-grained

Table 1. A General Research Framework of HRIS Design Characteristics.

At first, the type of HRIS success measure referring to particular stakeholders is considered to be obviously of relevance for HRIS design characteristics. For instance, whereas HRIS-related decision makers, system developers as well as system implementers may more focus on resource- (e.g. budget, time), feature-, or revenue-/profit-related issues, system users may tend to define HRIS success with a view to their level of individual productivity or satisfaction with the system [59, 60, 69]. Besides, system- and information-related design characteristics as a basic and rough categorization of HRIS design characteristics are introduced, defined and illustrated [11, 12, 46, 71, 76]. In addition to that, crucial application targets of system- and information-related HRIS design characteristics are presented, amongst them the development, the implementation as well as the permanent improvement of HRIS [13, 29, 61]. Furthermore, methods for the elicitation of HRIS design characteristics are illustrated as an important scientific milestone as researchers have to set the course which system- and information-related HRIS design characteristics will be evaluated subsequently at which quality. For example, HRIS design characteristics may differ according to their level of validity (e.g. universally applicable vs. contingent design characteristics) or granularity (e.g. coarse-grained vs. fine-grained design characteristics).

2.1 Type of Success Measure

HRIS success, also called HRIS effectiveness [11, 12, 19] among others, is understood as the degree to which the person developing, implementing or permanently improving HRIS believes that the stakeholder (in whose interest the development, implementation and permanent improvement is being made) is better off [58].
In so doing, IS success measures can be classified according to the following stakeholders, among others, HRIS-related decision makers, system developers, system implementers as well as system users [59, 69]. From a *decision maker*'s perspective, successful HRIS may maximize the following aspects, among others [60]: cost efficiency (e.g. IT operations), service-to-the-business-related issues (e.g. customer satisfaction with IT products/services), business improvements (e.g. IT support effectiveness) as well as revenue-/profit-related issues (e.g. IT profit generation, competitive advantage). On the other hand, from a *system developer*'s perspective, successful HRIS may be completed on time and under budget, may show a set of features consistent with the system specification, and may operate properly [13]. With a view to *system implementers*, successful HRIS may be easy and fast to adjust to the (internal/external) customers' requirements [13]. Finally, *system users* may find HRIS successful if they contribute to maximize, among others, their perceived level(s) of individual productivity, satisfaction or usefulness/ease of use while using these systems [8, 10, 11, 12].
However, in order to maximize HRIS success, researchers and practitioners have to know more about its underlying drivers. Thus, the subsequent chapter presents system- and information-related HRIS design characteristics as crucial drivers of HRIS success, among others.

2.2 Type of Design Characteristic

HRIS design characteristics are understood as a set of properties inherent to HRIS [28] by which they can be developed, implemented and permanently improved [13, 29, 61] and which are conceptually assumed or empirically verified to have a positive impact on system success [9, 11, 12, 46, 70, 71, 76]. There are different possibilities to categorize HRIS design characteristics, while a common categorization in the literature roughly distinguishes between *system-related* and *information-related* design characteristics [11, 12, 46, 71, 76]. Hence, system- and information-related design characteristics relevant to the success of HRIS are considered to constitute a basic and rough categorization of HRIS design characteristics. Whereas system-related design characteristics measure the desired properties of an HRIS itself (e.g. "reliability", "security" [45]), information-related ones (e.g. "understandability", "consistency" [45]) measure the desired properties which refer to the information provided by the HRIS [12]. Thus, system-related design characteristics may constitute a valuable means to the stakeholders involved (e.g. system developer, system implementer) to develop, implement and permanently improve successful HRIS. Besides, information-related design characteristics may support information providers in creating information relevant to system users' particular requirements (e.g. understandable, consistent and credible information).
Refining and adjusting these two major categories of HRIS design characteristics towards individual HR requirements, and subsequently considering these design characteristics, may lead to practical HRIS development, implementation and (permanent) improvement processes which may contribute to an overall HRIS success.

In so doing, the subsequent chapter illustrates the development, implementation and (permanent) improvement of HRIS by use of system- and information-related design characteristics as major fields of application where design characteristics may support the stakeholders involved in attaining successful HRIS.

2.3 Type of Application Target

Given their manageability, and thus their crucial impact on HRIS success [11, 12, 64], system- and information-related HRIS design characteristics may support the stakeholders involved in successfully accomplishing the development, the implementation as well as the (permanent) improvement of HRIS [13, 29, 61].

To begin with the *development* of HRIS, design characteristics may support the concretization of the system specification (i.e. how the HRIS will operate). In so doing, HRIS design characteristics may be concretized alternatively by use of technical concepts, i.e. pure textual descriptions or visual representations via UML diagrams and/or user interface mockups. Based on such a system specification, HRIS design characteristics may subsequently help the stakeholders involved to either build or select (in case of a packaged software design) HRIS accurately [13]. Thereby, the selection of pre-packaged HRIS by use of design characteristics may help to avoid costly misconceptions of HRIS as vendor software packages may not be selected based on an incomplete, inaccurate or irrelevant system specification [29]. Besides, organizations may decide to select an external HRIS developer, i.e. to outsource the HRIS development to an external company or to obtain access to existing software through an application service provider as external software developers may yield vast resources, experiences, and technical skills to design a much more effective solution than would be otherwise possible [29].

Beyond, during the *implementation* HRIS design characteristics might be considered as a valuable means which may guide the customization, i.e. the precise adjustment, of an HRIS to the (internal/external) customers' requirements.

Regarding the permanent *improvement* of HRIS, which is considered to be mainly ensured by their comprehensive evaluation, HRIS design characteristics are considered to constitute a valuable means to better monitor in how far the HRIS under consideration meets the (elicited/existing) design characteristics relevant to HRIS success.

Given this, it is of particular scientific interest to support practitioners in the specification (see Chapter 2.4 & 2.7), elicitation (see Chapter 2.5) and evaluation (see Chapter 2.6) of relevant HRIS design characteristics so that practitioners may develop, implement and permanently improve successful HRIS [26].

2.4 Range of Validity

In order to select and apply system- and information-related HRIS design characteristics within each of the application targets properly (see Chapter 2.3), it is relevant to the stakeholders involved to know about their validity, i.e. if particular HRIS design characteristics are thought to be universally valid or dependent on diverse contingency factors [32, 40].

In regard to possible *contingencies*, the success measure(s) to be achieved may constitute a prominent influence factor which may have a crucial impact on the validity of particular system- and information-related HRIS design characteristics to be selected and applied by the stakeholders involved. For instance, whereas HRIS-related decision makers, system developers and system implementers may more focus on resource- (e.g.

budget, time), feature-, or revenue-/profit-related issues, system users may tend to define HRIS success with a view to their perceived level of satisfaction with HRIS [59, 60, 69]. Hence, HRIS design characteristics may act as a function of their underlying contingencies, in this particular case the kind of success measure depending on the corresponding stakeholders involved (e.g. resource-, feature-, revenue-/profit-related issues or level of perceived satisfaction with HRIS). In so doing, design characteristics for stakeholders such as HRIS-related decision makers, system developers and system implementers may be shaped so that they might have a crucial impact on resource-, feature- or revenue-/profit-related issues (e.g. "pre-packaged", "easy and fast to customize", "economical", "reliable", "secure", etc.). As distinct from this, HRIS design characteristics for stakeholders such as system users might be streamlined in order to maximize their perceived individual productivity, respectively satisfaction while using HRIS (e.g. "understandability" and "consistency" of the information provided by the HRIS, etc.).

In addition to the success measure(s) to be achieved, the type of application target may be considered as a further contingency factor of HRIS design characteristics. For instance, during the development as well as the implementation phase, HRIS design characteristics contingent on the "organizational culture" [47], the "organizational context" (e.g. size, resource constraints, time frame, kind of HR core function [51, 56, 65]) or the "technological change" in general [56] may be considered in order to better adjust the HRIS to the (internal/external) customers' requirements. Beyond, HR core functions to be supported by HRIS [56], amongst them recruiting and selection [7] or training and development [66], may constitute another contingency factor which may have a crucial impact on HRIS design characteristics. Potential examples of such contingent HRIS design characteristics are, among others, the "accessibility of the user interface", the "user interface appeal", the "interactivity within the user interface", the "multimodality of information" [45] as well as the "multilingualism of information".

On the contrary, *universally valid* HRIS design characteristics may be best suited for the improvement of an HRIS and replaced by more contingent ones in order to better adjust to particular HRIS properties (e.g. portable competence profile, support of particular technical standards, etc.) or unexpected system errors/failures. Potential examples of such universally valid design characteristics are, among others, the "reliability" or "security" of an HRIS as the warranty of these design characteristics should always be ensured and not be driven by "cultural", "organizational" or "technological" contingencies.

Hence, HRIS design characteristics are thought to be located on a "continuum of validity", ranging from universally applicable HRIS design characteristics to highly contingent ones. Thereby, the knowledge about such a "continuum of validity" may help researchers in eliciting (see Chapter 2.5) and evaluating (see Chapter 2.6) appropriate HRIS design characteristics so that practitioners may develop, implement and permanently improve successful HRIS [26].

2.5 Method of Elicitation

The elicitation of HRIS design characteristics may predominantly be undertaken by researchers so that practitioners may draw on comprehensive sets of well-extracted design characteristics relevant to the development, implementation and (permanent) improvement of successful HRIS. In so doing, the elicitation of HRIS design characteristics constitutes an important scientific milestone as researchers determine

which HRIS design characteristics will be evaluated subsequently (see Chapter 2.6) at which quality (see Chapter 2.4 & 2.7).
Hence, methods of elicitation are understood as rigorous and thus systematic ways of ascertaining system- and information-related HRIS design characteristics which are made available to practitioners so that they may develop, implement and improve successful HRIS.
Thereby, the following ways of ascertaining HRIS design characteristics are suggested: theory-grounded as well as literature-, review-, use case-, case study- or survey-based approaches, and combinations of them.
Theories as a base for the elicitation of HRIS design characteristics can be generally described as a general set of statements which aim at explaining what is, predict what will happen and provide a basis for intervention and action [17]. In so doing, Doty and Glick [14] provide three primary criteria a theory should meet, namely: identification of constructs (here: independent variables such as design characteristics; dependent variables such as HRIS success measures), specification of relationships among these constructs which finally have to be falsifiable. In so doing, promising theories for the elicitation of HRIS design characteristics are, among others, the Technology Acceptance Model [8, 9, 10, 71, 72, 73] as well as the DeLone and McLean Model of IS Success [11, 12, 58]. This finding might predominantly be due to the fact that the Technology Acceptance Model as well as the DeLone and McLean Model of IS Success comprehensively illustrate (inter-)relationships between system- and information-related design characteristics and important measures relevant to HRIS success (e.g. individual productivity, satisfaction or usefulness/ease of use while using HRIS [8, 10, 11, 12]). However, due to its comprehensiveness and robustness, the application of the DeLone and McLean Model of IS Success is particularly recommended for a theoretically grounded elicitation of system- and information-related HRIS design characteristics. The outcome of such an elicitation procedure may consists of comprehensive sets of system- and information-related HRIS design characteristics which subsequently could be applied in the realm of (experimental/large-scaled) empirical studies.
Besides, *literature reviews* constitute another potential method for the elicitation of HRIS design characteristics. Thereby, a literature review may support researchers in better extracting, contextualizing or structuring information relevant to system- and information-related HRIS design characteristics, among others the kind of foundation (e.g. conceptual, theoretical), the object of analysis (e.g. HRIS in general, HRIS contingent on HR core functions such as training and development in particular), the data gathering or data analysis method as well as the results achieved. However, except one literature on design characteristics relevant to HRIS subtypes to training and development [45], there currently exists an urgent need to conduct such literature reviews as the selection and application of design characteristics uniformly appears to be highly arbitrary so far [45].
Concerning *use cases* as a potential means for the elicitation of HRIS design characteristics they may provide "a standard way of capturing, exploring, and documenting what a system should do" [5]. To be more concrete, use cases may support system developers in better contextualizing, and thus specifying HRIS requirements. In so doing, use cases may help system developers in selecting appropriate HRIS design characteristics which may subsequently support system implementers as well as HRIS-related decision makers during the customization and (permanent) improvement of HRIS [5].

In addition, *case studies* are equally considered to be a valuable instrument to help imitating and/or simulating a real situation where HRIS design characteristics may be an issue [16]. Thereby, the main purpose of case studies, which can be described as verbal representations of reality [16], is to illuminate a decision or set of decisions regarding the development, implementation and improvement by means of HRIS design characteristics as well as their impact on particular success measures [77]. In so doing, case studies might be a valuable means for training purposes (e.g. best practices in HRIS design characteristics) as they cover a huge plethora of contextual conditions which might be highly pertinent to the selection and application of design characteristics relevant to the success of the particular HRIS under consideration [77].

Regarding *survey techniques*, qualitative approaches can be distinguished from quantitative ones [30], whereas both of them can be either conducted experimentally or non-experimentally. Thereby, given the benefits of an experimental design, such as controlling relevant while excluding confounding variables, ensuring direct relevant experiences of respondents, and, particularly enabling the manipulation of specific HRIS design characteristics [31], experimental designs are considered to constitute a promising approach for researchers in order to empirically ascertain relevant system- and information-related HRIS design characteristics [50]. With a more particular view to qualitative approaches, focus groups may be particularly useful for exploratory research when rather little is known about the phenomenon of interest [6, 48, 62]. For example, a focus group may support researchers in the elicitation of unknown HRIS design characteristics as well as in their operationalization while preparing a questionnaire for a quantitative, (non-)experimental survey approach [30, 57]. In so doing, quantitative approaches such as (expert) Delphi studies may be an appropriate means for systematically analyzing complex and multifaceted HRIS-related issues that are not directly and easily accessible via quantitative research approaches [18, 20, 21, 33]. For example, there is pioneering work [45] which systematically ascertains system- and information-related design characteristics of HRIS subtypes relevant to training and development by use of an expert Delphi study amongst European e-learning experts. *Further approaches* for the elicitation of HRIS design characteristics are, among others, experimental standardized written offline interviews [50, 67] as well as non-experimental standardized written online [35, 52, 74] or offline [2] interviews.

Subsequent to the ascertainment of HRIS-related design characteristics, the content analysis may support researchers in coagulating, respectively extracting, relevant system- and information-related HRIS design characteristics out of the data acquired by "following content analytic rules and step by step models, without rash quantification" [43, 54].

Beyond mere manifestations, *combinatorial approaches* are considered to be most suitable as they may "pool the forces" of each single method of elicitation. For instance, the necessity of an expert Delphi study to elicit particular HRIS design characteristics may be the main outcome of a preceded literature review. The expert Delphi study in turn may be founded on a theoretical underpinning such as the DeLone and McLean Model of IS Success which offers a basic and rough categorization of system- and information-related design characteristics [11, 12]. Finally, the outcomes of the expert Delphi study may be then further discussed and refined in focus groups. In so doing, the application of a focus group may enable researchers to operationalize an end user-/expert-oriented questionnaire [30, 57]. This questionnaire may be then deployed in the realm of a large-scaled quantitative (non-)experimental survey which might aim at investigating the success of particular HRIS (subtypes).

2.6 Method of Evaluation

Supplement to the elicitation, the evaluation of HRIS design characteristics is an important step to find out in how far the HRIS under consideration actually meets the (elicited/existing) design characteristics relevant to HRIS success. Hence, the evaluation of HRIS employing corresponding system- and information-related design characteristics constitutes a central point to ensure the permanent improvement and thus the success of HRIS.

Thereby, empirical methods can be roughly distinguished from non-empirical ones. To begin with, *non-empirical* methods can be understood as a means by which researchers may conduct a plausibility check of the HRIS under consideration employing particular design characteristics. In so doing, HRIS design characteristics may enable researchers to eliminate elementary system errors/failures during each application target of an HRIS based on logical reasoning. Thereby, a plausibility check, respectively logical reasoning may be applied based on a theoretical underpinning such as the Technology Acceptance Model or the DeLone and McLean Model of IS Success. Such a theoretical underpinning may support researchers in better specifying research models which depict (inter-)relationships between particular HRIS design characteristics and important success measures. Beyond, further non-empirical methods of evaluation constitute so-called compatibility verifications. Such an approach may support researchers in carving out in how far the elicitation of particular HRIS design characteristics by means of the methods thoroughly described in Chapter 2.5 (e.g. literature review, use case, case study, etc.) may have led to the same results than the evaluation of HRIS by means of a theoretical underpinning such as the Technology Acceptance Model or the DeLone and McLean Model of IS Success.

As distinct from non-empirical methods, *empirical methods* are exemplarily represented by the case study approach, experiments and the survey approach which all together are considered to constitute a valuable means by which HRIS design characteristics may be evaluated. Thereby, the case study approach is considered to best support researchers in the course of an in-depth analysis of pioneering HRIS, respectively design characteristics. This is mainly due to the fact that this approach allows for an extensive and comprehensive evaluation of HRIS design characteristics using the example of a particular company, etc. Regarding experiments, researchers may profit from their particular benefits while evaluating pioneering HRIS, respectively design characteristics. In so doing, experiments may enable researchers to manipulate particular system- and information-related HRIS design characteristics as well as their influence on particular success measures by use of a theoretical underpinning such as Technology Acceptance Model or the DeLone and McLean Model of IS Success. Beyond that, further empirical methods of evaluation are, among others, the observation or the documentation of HRIS design characteristics [3].

Thereby, closely linked to the data gathering procedures presented, the analysis of these data constitutes a crucial aspect in order to carve out in how far the HRIS under consideration actually meet the (elicited/existing) design characteristics relevant to HRIS success.

Finally, *combinatorial approaches* of particular evaluation approaches are considered to "pool the forces" of each single method of evaluation. For instance, researchers may decide upon a combination of non-empirical and empirical evaluation approaches. In so doing, non-empirical evaluation approaches may constitute the first step in the evaluation of an HRIS by means of particular design characteristics, followed by more comprehensive and expressive empirical approaches such as large-scaled surveys in

order to evaluate HRIS by use of small sets of elicited/existing system- and information-related design characteristics.

2.7 Level of Granularity

Considering the preceding steps, researchers may be enabled to carve out particular (sets of) HRIS-related design characteristics. However, they do not know anything about their expressiveness or operational capability by then. Thus, the level of granularity of design characteristics indicates "the grade of operativeness and detailedness of design characteristics" [45]. This definition is based on the assumption that the level of granularity of HRIS design characteristics "can hardly be measured in terms of absolute numbers because of the subjectivity of the related concepts that may determine the granularity in question" [22]. Hence, we determine the level of granularity of particular HRIS design characteristics recursively [24], since a *coarse-grained* design characteristic (e.g. system quality) can be understood as the composition of more *medium-grained* and *fine-grained* design characteristics.
For example, coarse-grained design characteristics such as "system quality" may be further sub-divided into more medium-grained design characteristics such as "flexibility" and more fine-grained design characteristics such as "adaptivity" and "adaptability", whereas these fine-grained design characteristics in turn may hardly be further sub-divided into smaller, and at the same time, still expressive design characteristics.
With a view to the type of application target, more fine-grained design characteristics may be mostly appropriate while developing HRIS (e.g. preparation of a detailed system specification) whereas medium-grained ones might be most suitable while implementing and/or improving HRIS. In so doing, more coarse-grained design characteristics can be easily drilled down to more fine-grained, i.e. more expressive and detailed, measures in order to better adjust the HRIS in case of unexpected system errors/failures.
It is obvious, the expressiveness and usability of HRIS design characteristics increases with growing specificity (as for instance, "design/select/utilize personalized HRIS" constitute a more expressive and usable statement than "design/select/utilize HRIS with good systems quality"). However, growing specificity is commonly aligned with a decreasing range of validity (see Chapter 2.4). Hence, to warrant validity for all kinds of HRIS, future research into HRIS design characteristics should preferably deal with medium granularity.

To sum up, the present contribution provides a general research framework which illustrates the possibility space of selected issues relevant to HRIS design characteristics in particular. In so doing, the major benefits of the framework are as follows: firstly, the framework is considered to constitute a parsimonious framework which contains the most important aspect when dealing with HRIS-related design characteristics. However, similarly to design characteristics [45], all dimensions contained (with)in the framework are considered to be relevant in order to apply HRIS design characteristics, and thus HRIS successfully. Secondly, the framework comprehensively depicts specific success measures relevant to particular stakeholders, outlines system- and information-related design characteristics as mandatory categories which should be applied by the stakeholders involved developing, implementing and permanently improving HRIS. Beyond, the framework provides information about the kind of validity of design characteristics, supports researchers in the (initial) elicitation of HRIS-related design characteristics as well as the evaluation of HRIS by means of (these or already existing)

design characteristics. Finally, the framework proposes different kinds of granularity of HRIS design characteristics which may support researchers in choosing appropriate design characteristics for the right purpose. For example, during the development of an HRIS, more fine-grained design characteristics may be an appropriate means to determine an HRIS's properties at most precisely. As distinct from this, more coarse-grained design characteristics may be applied during the implementation or (permanent) improvement of an HRIS in order to have some rough success indicators which may be refined by means of more fine-grained design characteristics in case of unexpected system errors and/or failures. Thus, the framework is considered to be a valuable means which provides pointers to crucial aspects when selecting and/or applying HRIS design characteristics. Hence, the general objective of this research effort could be satisfactorily achieved.

3 Illustration

Supplement to the major benefits of the framework, the subsequent elaboration exemplarily illustrates each dimension of the framework by drawing back on an ongoing HRIS research project, the EU co-funded project iCOPER (Interoperable Content for Performance in a Competency-driven Society) [27], which aims at providing mechanisms to ensure European-wide user involvement, cooperation, and adoption of e-learning-related standards and specifications. In so doing, one of the main objectives is to provide a useful technological infrastructure which matches learners with learning opportunities, that is, trying to get learners into situations to which they are suited. This requires enabling learners to have access to a portable profile of their learning outcomes achieved after their successful completion of studies. In order to achieve this objective researchers of higher education and vocational training settings collaboratively develop, implement and improve pioneering HRIS subtypes relevant to training and development [66], also called Virtual Learning Environments (VLE). Thereby, VLE are understood "as electronic Information Systems (IS) for the administrative and didactical support of learning processes in vocational settings by systematically providing corporate learners adequate learning materials as well as corresponding collaboration facilities to develop intended qualifications" [45]. In so doing, VLE are considered as a prominent subtype of HRIS as they equally "aim at the generation and delivery of HR functionality in order to automate and informate Human Resource Management [63].

Thereby, the suggested framework supports the ongoing project work in the following way: at first, HRIS success measures relevant to system users, i.e. learners, were chosen, amongst them learners' satisfaction with the HRIS under consideration. Beyond, corresponding to the second dimension of the framework, system- and information-related design characteristics were chosen as a basic and rough categorization of those particular HRIS design characteristics to be elicited and evaluated subsequently. Thereby, system- and information-related design characteristics were mainly chosen to demonstrate the influence of particular system- and information-related design characteristics on learners' satisfaction with as well as the (behavioral intention to) use of the HRIS. Therewith, the development and (permanent) improvement of the HRIS under consideration could be systematically monitored and (minor/major) adjustments of system- and information-related HRIS design characteristics easily undertaken in order to maximize learners' satisfaction with the system. In line with the framework the utilization of fine-grained design characteristics was considered to be the most appropriate for preparing the final system specifications

of the different prototypes whereas medium-grained ones were chosen for improvement-related purposes. In so doing, more fine-grained design characteristics actually supported prototype task force members in determining the prototypes' properties most precisely. Subsequently, more coarse-grained design characteristics were applied during the build of the final applications, and similarly will be applied during the (permanent) improvement of the final HRIS as they turned out to constitute valuable and workable indicators of the HRIS' current development states. For instance, as prototype developers were faced with some unexpected system errors/failures these medium-grained design characteristics were easily drilled down to more fine-grained ones in order to better adjust the system errors/failures found by use of these more expressive and detailed measures. The same applies to the continuous evaluation of learners' satisfaction with the prototypical as well as final applications. Regarding their validity, prototype developers decided to draw on already existing HRIS system- and information-related design characteristics contingent on HR core functions such as training and development as well as innovative HRIS design characteristics contingent on the specific focus of the project (e.g. competency-driven provision of learning materials, support of technical standards relevant to training and development, etc.).
In so doing, the complete set of HRIS design characteristics was elicited by means of an expert Delphi study, considering the DeLone and McLean Model of IS Success as a theoretical underpinning for deriving system- and information-related design characteristics as recommended by the framework. Supplement to the elicitation, the evaluation of the prototypes as well as the final applications will be undertaken by use of the originally elicited set of system- and information-related design characteristics relevant to learners' satisfaction with these systems. In so doing, the corresponding research model will be based on amalgamations of the Technology Acceptance Model and the DeLone and McLean Model of IS Success will be analyzed deploying structural equation models.

4 Implications

The above-mentioned results should generally provide a basic starting point for future research relevant to HRIS design characteristics, while there are some implications for both research and practice. Generally speaking, the (dimensions of the) framework proposed should a) allow researchers to better understand and apply crucial aspects relevant to HRIS design characteristics so that b) practitioners may be better supported in developing, implementing and permanently improving successful HRIS.
In so doing, researchers should further elaborate each dimension of the framework proposed in order to supply practitioners such as HRIS-related decision makers, system developers as well as system implementers with a comprehensive set of well-elaborated guidelines in order to develop, implement and improve successful HRIS by means of particular system- and information-related HRIS design characteristics. Such efforts may be of crucial importance for the further advancement of this emerging field of research as already existing research attempts [25, 26, 34, 41, 42, 49, 53] as well as theoretical underpinnings such as the Technology Acceptance Model or the DeLone and McLean Model of IS Success do rarely propose concrete propositions what to consider when dealing with HRIS design characteristics in particular. At the same time, an extensive, research-driven elaboration of particular framework dimensions proposed such as the validity or the granularity of HRIS design characteristics may help to bridge the gap towards rigorous and relevant guidelines relevant to HR practitioners in particular [26].

On the basis of such rigorous and relevant outcomes practitioners such as HRIS-related decision makers, system developers as well as system implementers could then be equipped with comprehensive manuals for either managing the development, the implementation or the improvement of HRIS by means of particular system- and information-related design characteristics. Refining and customizing such manuals towards individual corporate settings and subsequently considering the manual may lead to practical HRIS development-, implementation- and improvement-processes which could contribute to minimize system users' resistance, increase system users' satisfaction, and support overall HRIS success.

5 Conclusions

Within this paper a general research framework of selected issues relevant to HRIS design characteristics was derived and exemplarily illustrated by means of an ongoing research project currently participated in on a European-wide level. This framework hopefully will stimulate future research regarding the development, implementation and improvement of HRIS by means of particular design characteristics. In so doing, the framework is thought to be continuously elaborated by, respectively supports researchers in their attempts to constantly improve HR-related IT artifacts by means of (particular/particular bundles of) HRIS-related design characteristics.

6 References

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