

A Set of Proposed Moral Principles for Knowledge Accumulation

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Abstract: Design Science Research (DSR) frequently develops artefacts in isolation from users. We propose moral principles to establish standards of good conduct for DSR researchers concerning community needs. The research question is: What moral principles can guide DSR researchers in reusing, developing, and sharing knowledge within the community? Drawing on perspectives of virtue, deontology, and consequentialism, our proposed moral principles focus on understanding community needs, constructing valuable knowledge, reusing existing knowledge, and co-educating the community.

Keywords: Design Science Research, Community Solution, Community Sharing, Researcher Participation

1. Introduction

Researchers apply the Design Science Research (DSR) methodology to build knowledge that can be used to design, implement, and evaluate solutions. A growing stream within previous DSR research has recently noted that DSR researchers tend to develop their knowledge and related solutions in isolation from the users and other research initiatives (Nguyen et al., 2019, Vom Brocke, Winter, Hevner and Maedche, 2020, Diaz et al., 2021, Schoormann et al., 2021, Reining et al., 2022, Tuunanen and Holmström, 2021). This isolation makes it hard to evaluate knowledge, solutions, and their quality. The lack of reuse of previous knowledge explains that while knowledge is created within communities and sub-communities, “finding the right way of describing [the knowledge] and interlinking new [knowledge] with existing [knowledge] is challenging across multiple projects.” (p. 33). The research problem involves accumulating and reusing knowledge within DSR communities, which poses an existential threat to DSR, as its highest purpose is to build knowledge that others can use to solve problems, drawing on the collective strength of many experts rather than personal experience. The risk of not reusing knowledge includes an ineffective research process, diverging results, and a diminished status among other researchers due to the formation of monoliths.

DSR researchers have given various propositions to counter the above problem, such as adopting an ontological approach (Nguyen et al., 2019), adding a refactoring cycle to Hevner’s three cycles (Diaz et al., 2021), following an organizing framework in research (Tuunanen and Holmström, 2021), and modelling of scientific DSR progress (Reining et al., 2022). Concurrently, solutions have been developed; tools and methods are available to synthesise existing DSR knowledge (e.g., Vaishnavi, 2007, Dresch et al., 2015). Their creation and application in isolation still indicate less need for additional solutions, but rather a shift in how DSR researchers conduct their research. We believe a minor adjustment could alleviate the knowledge accumulation problem by transitioning from the problem-solving paradigm to an axiological one. An axiological paradigm centres on social systems that arise from the desired behaviours and characteristics of DSR researchers. Behaviours that foster community could be perceived as positive, while behaviours that promote isolation could be seen as unfavourable, reflecting the intent of established moral principles. Previously, (Myers and Venable, 2014) have proposed six moral principles for DSR researchers: (1) the public interest, (2) informed consent, (3) privacy, (4) honesty and accuracy, (5) property, and (6) quality of the artefact. However, these principles do not cover knowledge accumulation. This paper proposes a set of moral principles to guide DSR researchers in reusing, developing, and sharing knowledge as part of a community. A moral principle is a moral rule or standard of good behavior that promotes reflection and thoughtfulness beyond specific solution design. This type of principle aims towards reflection and thoughtfulness in action, going beyond the design and implementation of specific solutions, helping to organize and participate in social systems. This research is a response to the call of (Herwix et al., 2022) who advocated for a more systematic and deliberate engagement with axiology in DSR. Our research also contributes to the six moral principles (Myers and Venable, 2014), igniting a debate regarding the assumed moral principles of previous DSR research and its knowledge accumulation, thus taking a step towards a moral theory for DSR methodology. The following research question guided this investigation:

RQ: What moral principles may guide DSR researchers in reusing, developing, and sharing knowledge as a community?

The article includes related works, proposed moral principles for knowledge accumulation, and illustrations from two studies. It discusses both good and bad research, the morals of engaging a community, applications, and challenges.

2. Previous Research

This section includes proposed moral principles, virtue, deontology, and consequentialism

2.1 An Axiological Paradigm

Axiology refers to basic beliefs about ethics and value (Funk, 2001), including the systematizing, defending, and recommending of moral principles of good behaviour (Fieser and Dowden, 2011). It asks a researcher to guide his or her conduct by reason while giving equal weight to the interest of others affected by his or her actions (Rachels and Rachels, 2019). For example, (Vom Brocke, Winter, Hevner and Maedche, 2020) stress the importance of DSR as a collaborative, evolutionary endeavour, which builds upon previous knowledge to create new knowledge. Generally, moral principles can be understood using three normative ethics: virtue ethics, deontology, and consequentialism (Rachels and Rachels, 2019, Herwix et al., 2022).

1. **Virtue** ethics relates to what it means to be a good researcher, empathizing the roles of ideal character traits and environment (e.g., education, society, and family) (Athanasoulis, 2004, Rachels and Rachels, 2019, Herwix et al., 2022). For example, in the case of (Vom Brocke, Winter, Hevner and Maedche, 2020), a virtuous DSR researcher reuses and shares knowledge.
2. **Deontology** concerns a researcher's rights, duties, and permissions. It highlights morally required, forbidden, or permitted actions while guiding and assessing a researcher's actions (Alexander and Moore, 2021, Herwix et al., 2022). For example, plagiarism is a forbidden act (Davison et al., 2004), while the problem of knowledge accumulation (Vom Brocke, Winter, Hevner and Maedche, 2020) is based on an assumed duty for DSR researchers to build knowledge together.
3. **Consequentialism** focuses on the consequences of actions. It explores the nature of good and bad consequences, and who experiences these consequences (Sinnott- Armstrong, 2021, Herwix et al., 2022). For example, a core idea of DSR is that the research improves, innovates, or extends solutions to solve problems, while contributing to knowledge development (Gregor and Hevner, 2013).

However, no normative ethics can satisfactorily answer good and destructive behaviors. Virtue ethics is challenging to apply in complex situations. It cannot resolve moral conflicts, deontology fails to see contextual nuances, and consequentialism allows for horrible actions in the name of good. Instead, they can be viewed as supplementing each other (Rachels and Rachels, 2019). The three normative ethics can be identified in previous DSR research. (Myers and Venable, 2014) proposed six moral principles for DSR researchers, which we present in Table 1 connected to the three normative ethics.

3. Research Approach

Previously, we conducted two DSR projects and are knowledgeable in ethics and morality. As we worked on these projects, we came in contact with the knowledge accumulation problem in previous DSR research and found that it is a focus for some (Nguyen et al., 2019, Vom Brocke, Winter, Hevner and Maedche, 2020, Diaz et al., 2021, Reining et al., 2022, Tuunanen and Holmström, 2021), which was surprising as we had not experienced it.

We returned to the method descriptions of our DSR projects, studying them for good and bad behaviours. Our DSR projects are chosen due to our internal depth of knowledge.

Table 1: Myers and Venable (2014) proposed six moral principles connected to the three normative ethics.

Ethical Principle	Description	Normative Ethics
The Public Interest	Identify stakeholders and consider how they may be affected by the research output.	Consequentialism
Informed Consent	Obtain informed consent from participants in the research.	Deontology
Privacy	Safeguard privacy of stakeholders.	Deontology

Ethical Principle	Description	Normative Ethics
Honesty and Accuracy	Do not plagiarize ideas. Acknowledge inspirations. Be honest.	Deontology and Virtue Ethics
Property	Ensure ownership Agreements and rights to publish.	Deontology
Quality of the Artefact	Every attempt should be made to ensure the artefact's quality. Design should account for and address risks. Ensure safe use.	Consequentialism and Deontology

from enacting the research and the ease of comparison. The return process was supported through retrospection and discussions. We brainstormed tentative moral principles to cover our behaviours on a digital collaborative surface. It was possible to identify a tentative set of moral principles. As such, we revisited previous research on ethics to identify normative ethics that could help us develop the tentative set of moral principles. We identified three normative ethics (see Section 2.1) using them as design tools. We perceived each moral principle from normative ethics, filling in further details. Virtue ethics highlighted the ideal character traits and the environment of DSR researchers. Deontology emphasised the duties and rights of DSR researchers. Consequentialism stresses outcomes and stakeholders.

4. A Set of Proposed Moral Principles for Knowledge Accumulation

This section presents a set of proposed moral principles that have been constructed to guide DSR researchers when reusing, developing, and sharing knowledge as part of a community, driving a collective process of problemsolving. A moral principle is written to be universal and general, making no essential references to particular people, times, or places. Any particularities are captured through concepts and roles. Its content may range from quite narrow (covering only one case) to highly general (covering all cases) (Väyrynen, 2018).

Our first moral principle is theoretical in nature, placing a standard for DSR research to be considered to have a moral feature, such as rightness or wrongness (Väyrynen, 2018). A society with problemsolving experts is desirable since they can work to overcome, for example, poverty, starvation, and disease, but also bring about a better tomorrow. They can help society avoid or mitigate disasters, such as earthquakes, forest fires, and war. The backbone of this expertise is a knowledge base used to educate and inform experts, helping them solve problems. However, this base requires constant knowledge accumulation, as, with time, things change, disappear, and new problems emerge (See, e.g., Caiden, 2017). While the DSR methodology refers to a collective enterprise set out to solve problems, **DSR researchers act to accumulate a knowledge base that helps experts solve problems.** Help (The Cambridge Dictionary, 2019) in this context means knowledge should make it possible or easier for experts to solve problems, as the DSR researchers have done part of the problem-solving and provided this knowledge.

Based on the above theoretical moral principle, we have constructed practical moral principles, which can guide research activities and decisions of DSR researchers. These principles are constructed to help DSR researchers realize our theoretical moral principle. As such, knowledge accumulation. The practical moral principles are as follows.

First, **DSR researchers explore an expert community's knowledge needs**, as the intention is to help experts solve problems. It requires them to be knowledgeable about the community and when and how to solve the needs. Researchers who engage a community with curiosity can quickly move to the edge of the community's knowledge development, allowing them to identify novel gaps and opportunities. The development of knowledge or solutions for these gaps or opportunities has a higher likelihood of being relevant, even if only for that community. Relevance is, therefore, based on a knowledge contribution's possible ability to progress a community towards satisfying solutions.

Second, **DSR researchers construct helpful knowledge for experts**, necessitating an understanding of the community as the audience for this knowledge. If researchers intend for experts to utilise their knowledge, they must take into account its applicability for the audience. It is crucial to consider the experts' language, preferred medium and communication format, as well as the concepts employed. This demonstrates a commitment to service and consideration for future generations, reflecting an admirable trait of responsibility. The focus on reuse facilitates the emergence of a valuable knowledge base for experts, while also allowing researchers to utilise knowledge to respond more swiftly and enhance

creativity. More importantly, it empowers experts to create original knowledge and make contributions to the knowledge base. DSR researchers must adapt to the experts’ paradigm. However, neglecting this moral principle may lead experts to find knowledge incomprehensible or perceive it as irrelevant to their work; consequently, they might attempt to reinvent the wheel or struggle to resolve a problem. The knowledge base may become a collection of isolated fragments, each reiterating solutions to problems that have already been addressed, thus squandering resources and hindering collaboration.

Third, **DSR researchers reuse the knowledge base**, evaluating and validating this knowledge, but also questioning its helpfulness. It is a sign of respect and consideration for others’ wisdom. This reuse allows a stable knowledge base to emerge where researchers can save time and avoid redoing previous pitfalls. More importantly, it provides the grounds to argue for original knowledge contributions and to scrutinise for further developments. DSR researchers have a duty to meta-discuss the helpfulness of knowledge, keeping other DSR researchers accountable, as part of discovering helpful knowledge. The inability of knowledge to help experts is an important motivation for DSR research. An argument to set out on a new research project. On the other hand, a failure to properly draw on previous knowledge risks accusations of plagiarism and purposefully reinventing the wheel.

Fourth, **DSR researchers participate in the co-education of the knowledge base**, following the educational processes of the expert community, while drawing on a broad theoretical and practical knowledge base. Experts’ understanding of problems and the development of solutions change over time. These changes can help researchers identify dead ends, requirements, and needs. It is possible that experts are ahead of DSR researchers in the knowledge development process, as such following them can provide clues where the next key knowledge contribution may be made. At the same time, a community is an important outlet for any produced knowledge, where its presentation and discussion can provide new opportunities and avenues. The pedagogical ability to learn with and teach experts is an ideal character trait for DSR researchers. However, disregarding this moral principle, means that constructed knowledge may never reach the experts, but also that key insights into how to solve the problem from within the community never reach the researcher.

Table 2 presents a summary of the above proposed moral principles for knowledge accumulation. Each principle has been connected to the three normative ethics, highlighting their role and influence.

5. Illustrations

We conducted two DSR projects as part of the Open Government Data (OGD) community. OGD refers to data shared by public organizations (in the role of providers) to be reused by anyone at any time and anywhere without restrictions (Attard et al., 2015, Handbook, 2015, Hossain et al., 2016). Journalists, students, researchers, and developers (in the role of users) enrich OGD into various solutions for the public. Generally, the community experiences problems solved by OGD (e.g., lack of transparency)

Table 2: A Set of Proposed Moral Principles for Knowledge Accumulation

DSR re-searchers...	Virtue Ethics	Deontology	Consequentialism
Act to accumulate a knowledge base that helps experts solve problems	Academic, Problem Solver	Knowledge Accumulation	A Better Tomorrow
Explore an Expert community’s knowledge needs	Curiosity, Problem-Finder	Engage Experts	Relevancy
Construct helpful knowledge for experts	Service, Responsibility	Adjust to the Expert Paradigm	Helpfulness
Reuse the knowledge base	Humbleness, Expertise	Reuse knowledge	Originality

DSR re-searchers...	Virtue Ethics	Deontology	Consequentialism
Participate in co-education of the knowledge base	Collaborative, Pedagogic	Exchange knowledge	Impact

and data as an untapped resource), problems of OGD (e.g., how to make anyone be able to discover and understand the data), problems in OGD (e.g., low return on investment for providers and low data quality for users), and problems from OGD (e.g., violations of privacy and distortion of data) (Crusoe, 2021). Our two DSR projects focused on problems of OGD, which was common within the community (following step 1 in DSR by (Peffer et al., 2007)). Two common problems are as follows. First, how to transform the open data into something with utility or value for others. Some suggested solutions are (Davies, 2010, Lindman et al., 2016, Portal, 2017). Second, how to publish data as open data? Examples of solutions are (Hyland and Wood, 2011, Lee, 2014, Nečaský et al., 2014, Zuiderwijk et al., 2014, Naturvårdsverket, 2018). The first of our DSR projects focused on the first problem, while the second of our DSR projects focused on the second problem.

5.1 Illustration 1: The User Framework

The first DSR project resulted in our article (Crusoe and Ahlin, 2019), where we created a conceptual framework for the user process related to OGD. Overall, we worked closely with the OGD community and analyzed the literature and empirical material in various inductive, abductive, and deductive steps. The method can be summarized as three steps: (1) create a tentative framework, (2) a formative evaluation of the tentative framework, and (3) a summative evaluation of the framework. The steps were iterative and longitudinal. We worked iteratively in the first step with research articles to create a skeleton framework from a sketch. This step aimed to synthesize previous knowledge about the solutions and their related problems. We selected one article as sketch and filled the sketch with previous knowledge based on a goal-oriented literature review, adding missing data to the skeleton. The second step started with a formative evaluation, where we demonstrated and evaluated the tentative framework as a practical test. The tentative framework was tested to compare two contexts. We chose these contexts to get feedback and increase generalization (Crusoe et al., 2019). The third step was a summative evaluation, adding to the broader scope of the tentative framework. We refreshed the tentative framework through a systematic literature review. Then, we created templates from the framework, which we used as templates for interviews.

Table 3: Illustration 1

Moral Principle	Examples
DSR researchers explore an expert community's knowledge needs	Participated in OGD forums; Talked with OGD experts; Noted a focus of reuse of data, but little understanding of its process
DSR researchers construct helpful knowledge for experts	Identified that experts used process-descriptions to communicate around the problem
DSR researchers reuse the knowledge Base	Started building the framework from a scientific article; Knowledge base as an input to the construction of the framework
DSR researchers participate in co-education of the knowledge base	Presented the frameworks in lectures and seminars; Wrote and distributed a popular science article; Interviewed experts

5.2 Illustration 2: The Provider Framework

The second example is based on our article (Crusoe and Ahlin, 2022), where we created a conceptual framework for the provider process related to OGD. Overall, we worked closely with the OGD community and analyzed the literature and empirical material in various inductive and abductive steps. The method can be synthesized in two steps:

(1) create a skeleton framework and (2) demonstrate and evaluate the framework, supported by (Peffer et al., 2007). Our initial step began with desktop research, and we utilised these findings to create a sketch while incorporating results

from an exploratory literature review. This was followed by conducting exploratory interviews. The empirical material was analysed, enriching the sketch framework and forming a skeleton. Subsequently, OGD experts assessed the skeleton framework through interviews based on a popular scientific article. The second step concentrated on demonstrating and evaluating the skeleton framework, gathering feedback, using that feedback to construct a tentative framework, and reflecting on the tentative framework. We began collecting feedback by discussing the skeleton framework at an academic workshop focused on e-government (Crusoe and Ahlin, 2020).

Table 4: Illustration 2

Moral Principle	Examples
DSR researchers explore an expert community's knowledge needs	Followed the developments in the OGD community; Noted researchers and practitioners attempting to solve the same problem
DSR researchers construct helpful knowledge for experts	Identified that public organizations shared knowledge following a form of work framework
DSR researchers reuse the knowledge Base	The knowledge base was used to construct the work framework
DSR researchers participate in co-education of the knowledge base	Interviewed experts; Meeting with Experts

6. Discussion

This section explores the concept of morally good and bad DSR research, the moral implications of engaging an expert community, and the potential application of our moral principles, as well as any related challenges.

6.1 Morally Good or Bad Research?

An axiological paradigm entails questions about good and bad actions and consequences, supported by good reasons for these classifications (Rachels and Rachels, 2019). It goes beyond understanding what is good and bad, but also why (Väyrynen, 2018). While our moral principles are formulated following law-like generalizations, they are based on the idea of good and bad as a spectrum (see differences between Table 3 and Table 4). In this case, “good” refers to actions contributing to knowledge accumulation, while “bad” refers to actions hampering knowledge accumulation (Sinnott-Armstrong, 2021, Gregor and Hevner, 2013). The principles’ general nature also allows various approaches to fulfilling them, but also an ability to judge if research activities are working towards this fulfilment. Attached to the axiological paradigm is the idea of encouraging good actions while discouraging bad actions, which needs to be proportional to the degree of goodness or badness (Fieser and Dowden, 2011). In the case of DSR, researchers want knowledge accumulation to take place (Nguyen et al., 2019, Vom Brocke, Winter, Hevner and Maedche, 2020, Diaz et al., 2021, Schoormann et al., 2021, Reining et al., 2022), as such it could be tempting to severely discourage any failure to fulfil our moral principles (knowledge accumulation). However, this approach could discourage innovation and risk-taking, hampering knowledge development (vom Brocke, Hevner and Maedche, 2020). Another approach is to understand why a DSR project failed in contributing to knowledge accumulation; drawing lessons learned, which can help researchers avoid similar situations in the future (Nguyen et al., 2019, vom Brocke, Hevner and Maedche, 2020, Diaz et al., 2021, Schoormann et al., 2021, Reining et al., 2022, Tuunanen and Holmström, 2021). As a result, DSR researchers should cultivate a culture where knowledge accumulation is praised and rewarded as morally good.

6.2 Moral to Engage Community

Engaging within a community is fundamental to our proposed moral principles. Therefore, it is essential to understand which community we focus on (vom Brocke, Hevner and Maedche, 2020) While finding out what the community looks like, the next step is understanding how to enter it. In a community with stated norms, there might be an official way to enter it, while for the more loosely coupled community, networking could be one way. Still, it takes time to enter and understand a community and market yourself as a contributing partner. There are several ways to contribute, and one way is to present and discuss knowledge contributions with interested parts of the community, emphasised by (Gregor and Hevner, 2013). One essential part is to find the communities or persons interested in collaborating. The implication is that DSR researchers’ moral goodness depends on other actors.

6.3 The Application of the Principles

The created moral principles can be applied in various ways. One way is to incorporate them into the conducted activities of DSR, e.g. the DSR process. The understanding of the moral principles and their implication on the research process must be discussed between researchers to adjust to the specific context, e.g. how to understand the community and how to approach it. The moral principles then act as a basis for reflection and can also be viewed as a purposeful motivator for the research design (Fieser and Dowden, 2011, Rachels and Rachels, 2019). Researchers can also approach moral principles in various stages of their knowledge of research design, such as practitioners, PhD students, Senior Lectors, or Professors. Therefore, the variation in applying the moral guidelines could vary but still, be helpful in their described generality. As well as the content of the moral principles, their possible consequences vary, e.g. described by (Herwix et al., 2022, Sinnott-Armstrong, 2021). One consequence could be the impact on the community, as well as other impacts on future research.

7. Conclusion

This paper proposes a set of moral principles for researchers' knowledge accumulation in DSR. This set can be used as an evaluation framework for DSR research, adding to its scientific status and ability to accumulate knowledge. The set is based on a theoretical moral principle as a standard for good DSR research: "*DSR researchers act to accumulate a knowledge base that helps experts solve problems*". We supplemented this theoretical principle with four practical moral principles, acting as guides for DSR researchers who should: (1) explore an expert community's knowledge needs, (2) construct helpful knowledge for experts, (3) reuse the knowledge base, and (4) participate in co-education of the knowledge base. The general nature of the moral principles' challenges DSR researchers to discuss their meaning and implications for their research, while also giving them the opportunity to identify their limitations as new moral territory.

There are limitations to this paper. The proposed set of moral principles was developed based on two previously conducted DSR projects, meaning we are reflecting in retrospective. The development process was made in retrospect, giving us insight into what worked and what did not. A consequence was that the degree of moral fulfilment differed between the illustrations, emphasising the importance of a moral spectrum. While the general nature of the moral principles can make them difficult to apply, it encourages DSR researchers to justify their research deliberately.

Future research should work to explore further moral elements of DSR beyond knowledge accumulation. For example, the moral nature of knowledge evaluation and solving problems. It is time to open a nuanced discussion about good and bad DSR research practices, helping us to understand the full expression of a moral theory for DSR research. A tentative next step could be to develop one or more theoretical moral principles for why and how DSR research is good.

Ethics Declaration

No ethical clearance was required for the research.

AI Declaration

No AI tools were used for conducting the study or writing the article.

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