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# Use-inspired basic research at SNSF

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**Final report**

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technopolis <sub>group</sub> May 2017

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# Table of Contents

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Summary.....	1
Zusammenfassung.....	2
Résumé .....	3
Introduction.....	4
<b>1 UIBR at SNSF: Context, uptake and success rates.....</b>	<b>5</b>
1.1 Origins of the term and funding scheme .....	5
1.2 Headline figures: uptake.....	6
1.3 Headline figures: success rates .....	7
1.4 Towards an explanation of UIBR’s lower success rates .....	8
1.4.1 Success rate discrepancy: institution type as an explanatory factor .....	9
1.4.2 Success rate discrepancy: Disciplinary trends as an explanatory factor .....	9
1.5 Explaining success rates: a context for the following sections .....	10
<b>2 Use-inspired basic research: Meanings and understandings .....</b>	<b>11</b>
2.1 Profile of UIBR grants: outputs and further outcomes.....	11
2.1.1 Further funding and possible duplication with BRIDGE/CTI .....	12
2.2 Defining UIBR.....	13
2.2.1 Towards a definition .....	14
2.3 Definitions and difficulties: towards an evaluation of UIBR funding .....	16
2.3.1 A note on perceived barriers .....	17
<b>3 The SNSF UIBR stream: process evaluation.....</b>	<b>18</b>
3.1 Perceptions and satisfaction .....	19
3.2 The application stage .....	20
3.3 Secretariat check.....	21
3.3.1 Direct rejection rates .....	21
3.3.2 Referee selection and representation.....	22
3.3.3 Reviewer selection .....	22
3.4 Refereeing and reviewing .....	23
3.4.1 A note on assessment criteria.....	23
3.4.2 Reviewing.....	23
3.4.3 Refereeing .....	25
3.5 The funding process: conclusions.....	26
<b>4 Profile and additionality .....</b>	<b>27</b>
4.1 Knowledge of comparable alternative schemes .....	27
4.2 Future perspectives and additionality.....	27
<b>5 Funding UIBR: problems and options .....</b>	<b>29</b>

5.1	The SNSF UIBR stream: a brief re-appraisal .....	29
5.2	Defining UIBR: communication and implications .....	31
5.3	Looking ahead: towards optimised UIBR funding at SNSF .....	32
5.4	A note on Interdisciplinary research and Sinergia.....	34
<b>6</b>	<b>Conclusions and recommendations .....</b>	<b>36</b>
6.1	Beyond ‘excellence’ .....	36
6.2	Summary of answers to the evaluation questions.....	36
6.2.1	Definition and understanding of the term ‘use-inspired basic research’ .....	36
6.2.2	Handling during evaluation phases .....	38
6.3	Recommendations .....	38
	Appendix A Bibliography .....	40
	Appendix B Additional data .....	41
	Appendix C Methodological details .....	77

## Tables

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Table 1:	Success rates by subject division and institution type – UIBR/Non-UI difference.....	8
Table 2:	Correlations in the analysis of 32 SNSF research domains and disciplines .....	9
Table 3:	Correlations in the analysis of 32 SNSF research domains and disciplines, by institution types.....	10
Table 4:	A typology of UIBR definitions .....	14
Table 5:	Applications analysis – ‘Broader Impact’ statements and the UIBR typology .....	16
Table 6:	Broader Impact statement attributes by institution type.....	20
Table 7:	Research Councillors/ Panellists from traditional vs. non-traditional research performing institutions ..	22
Table 8:	Reviewers’ disagreements on broader impact of applications.....	24
Table 9:	UIBR types – implications for applicants and evaluation.....	32
Table 10:	Success rates by subject division and institution type.....	47
Table 11:	Analysis of success rates by discipline/ field .....	47
Table 12:	Applications by division and institution type .....	51
Table 13:	RCs/ panellists by division and institution type .....	52
Table 14:	Comparison: Applications vs. Panel/RC representation by division and institution type .....	53
Table 15:	Data table – academic outputs of UIBR grants.....	56
Table 16:	Data table – academic outputs of Non-UI grants .....	56
Table 17:	Data table – non-academic outputs of UIBR grants .....	57
Table 18:	Data table – non-academic outputs of Non-UI grants .....	57
Table 19:	Barriers to UIBR – breakdown by division, institution type and application outcome .....	60
Table 20:	Reasons for applying – breakdown by division and institution type .....	63
Table 21:	Character and length of ‘Broader impact’ feedback.....	65
Table 22:	thematic congruence between ‘Broader impact’ statements and reviewers’ comments .....	67

Table 23: Factors behind the lower UIBR success rate .....	68
Table 24: Survey response details .....	77
Table 25: Interviewees for the programme of exploratory interviews .....	89
Table 26: Interviewees for the process evaluation interviews.....	89
Table 27: Key issues in brief (for summary and survey question-building) .....	91
Table 28: Sample of UIBR applications used for content analysis .....	92
Table 29: ‘Broader impact’ statements – coding frame 1 (length and presentation) .....	93
Table 30: ‘Broader impact’ statements – coding frame 2 (theme) .....	93
Table 31: Reviews of broader impact – coding frame 1 (length and character).....	94
Table 32: Reviews of broader impact – coding frame 2 (theme) .....	95
Table 33: Observations: themes of discussion points per proposal .....	96

## Figures

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Figure 1: Pasteur’s Quadrant.....	5
Figure 2: Total uptake of the UIBR option .....	6
Figure 3: Total success rates .....	7
Figure 4: Productivity – academic and non-academic outputs.....	11
Figure 5: Productivity – different types of non-academic output .....	12
Figure 6: Further funding obtained .....	12
Figure 7: Clarity of UIBR definition.....	14
Figure 8: Definitions of UIBR .....	15
Figure 9: Outline of the SNSF evaluation process.....	18
Figure 10: SNSF applicants’ assumptions about UIBR success chances .....	19
Figure 11: UIBR applicants’ satisfaction with the application process .....	19
Figure 12: Application in the future .....	27
Figure 13: Counterfactual – what if your UIBR application had not been funded? .....	28
Figure 14: Unsuccessful UIBR applicants – next steps .....	28
Figure 15: SNSF applicants’ views on how to fund UIBR.....	33
Figure 16: Uptake of the UIBR option by institution type.....	41
Figure 17: Uptake by institution type, over time .....	42
Figure 18: Uptake of the UIBR option by subject division .....	42
Figure 19: Uptake of the UIBR option over time, by subject division.....	43
Figure 20: Success rates by subject division.....	44
Figure 21: Success rates over time, by subject division .....	45
Figure 22: Success rates by institution type .....	45
Figure 23: Direct rejection rates .....	46
Figure 24: Direct rejection rates, by subject division and institution type.....	46
Figure 25: Success rates in Division 3: Biology / Medicine discrepancies .....	49

Figure 26: Gender of Applicants .....	50
Figure 27: Age of first-time UIBR applicants .....	50
Figure 28: Age of first-time Non-UI applicants.....	51
Figure 29: Productivity – Different types of academic output.....	54
Figure 30: Productivity – different types of non-academic output.....	55
Figure 31: Perceived barriers to UIBR.....	59
Figure 32: UIBR applicants’ motivations for declaring UIBR.....	62
Figure 33: Non-UI applicants’ decision not to select the UIBR option.....	65
Figure 34: UIBR types – connections between applications and feedback .....	66

## Summary

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Introducing a use-inspired basic research (UIBR) category into SNSF's main project funding scheme was a bold step, strengthening its ability to fund basic research that is done with an area of application in mind in addition to curiosity-driven work.

Twenty per cent of SNSF project applications are marked by their authors as UIBR. Their success rate (38%) is considerably lower than for their Non-UI counterparts (54%), although these figures vary somewhat among SNSF subject divisions and the types of institutions that apply.

### Definitions and characteristics

Foremost, UIBR is basic research, but UIBR projects have a dual focus: to solve or illuminate one or several practical problems as well as advancing science. This can make UIBR projects inherently more challenging than others to design.

UIBR projects produce slightly fewer academic outputs than others: 88% of UIBR projects produce at least five academic outputs (articles in international, peer reviewed journals, conference papers, etc.), compared with 93% of their Non-UI counterparts. However, they produce more non-academic outputs (e.g. patents, designs, policy reports, practice guidelines) than Non-UI projects. UIBR projects often lead to further funding beyond the end of the project from a range of different sources, though less regularly than Non-UI projects.

### Process evaluation

UIBR applicants are broadly satisfied with those aspects of the proposal assessment process that are visible to them (clarity, guidance and support from SNSF, ease of application, speed of decision). Around a quarter believe that selecting the UIBR option has a directly positive or negative effect on the likelihood of receiving funding.

A successful SNSF application is required to be adequate on all assessment criteria and outstanding in some. The 'broader impact' dimension of UIBR can compensate for minor weaknesses elsewhere, but, if poor, can also present an additional negative factor. Research Council and panel members are happy with their ability to take into account the 'broader impact' in their evaluation.

The difference in success rates between UIBR and Non-UI proposals cannot be explained simply by the nature of the institutions applying, or by the disciplines. Issues in the UIBR proposal assessment process which may depress the success rate include: over-use of metrics (e.g. h-index) to judge track record; lack of a system to mandate discussion of broader impact in the Research Council and panels; applicants' perception that UIBR duplicates other programmes (potentially leading to erroneous application); a higher 'direct' (administrative) rejection rate; a shortage of practitioner reviewers; and under-representation of referees from non-traditional research performing institutions (e.g. UAS/UTE).

### Future perspectives and recommendations

The UIBR instrument and its consideration of broader impact is seen as positive by many stakeholders, and our findings do not suggest major change to be necessary. There is scope for more UIBR projects in the future, since most applicants would consider applying for a UIBR project again. A large proportion of UIBR applicants said that they could not have conducted their research without the grant.

However, the issues identified in this report imply a need for some minor changes. These include publishing a clearer definition of UIBR using the typology developed in this study (and adding an explicit distinction between UIBR and BRIDGE/CTI), fully implementing the San Francisco Declaration on Research assessment which SNSF has signed, diversifying the pool of reviewers and referees, and ensuring UIBR applications have additional space to explain their 'broader impact'.

## Zusammenfassung

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Die Einführung der Kategorie ‚anwendungsorientierte Grundlagenforschung‘ (aoGF) in das Förderschema des Schweizerischen Nationalfonds (SNF) war ein wichtiger Entscheid und verhalf dem SNF zu einer verbesserten Förderung von Projekten, die neben einem wissenschaftlichen Erkenntnisgewinn auch einen Anwendungsbezug haben.

Zwanzig Prozent aller Gesuche werden durch ihre Autoren als aoGF gekennzeichnet. Die Erfolgsquote der aoGF Gesuche (38%) ist deutlich geringer als die der Gesuche, die nicht als anwendungsorientiert deklariert wurden (54%), wenngleich die Anteile in Bezug auf Disziplin und Art der Forschungseinrichtung variieren.

### **Bedeutung und Eigenschaften**

AoGF ist Grundlagenforschung mit zwei Schwerpunkten: zum einen der Beitrag zur Lösung eines Problems aus der Praxis, zum andern der Beitrag zu wissenschaftlichem Fortschritt. Diese an sich doppelte Zielsetzung kann das Design und die Durchführung von aoGF Projekten erschweren.

AoGF Projekte generieren einen geringfügig niedrigeren wissenschaftlichen Output: 88% der aoGF Projekte haben mindestens fünf wissenschaftliche Veröffentlichungen erreicht (z.B. Artikel in internationalen akademischen Zeitschriften mit Peer Review, Bücher, Konferenzbeiträge), im Vergleich zu 93% bei Projekten der Grundlagenforschung (GF). Bei nicht-akademischen Outputs (z.B. Patente, Design, Politikberichte, Praxisrichtlinien) liegt die Produktivität jedoch deutlich höher als bei GF Projekten. AoGF Projekte akquirieren nach Projektende oft weitere Forschungsgelder, wenn auch weniger häufig als GF Projekte.

### **Begutachtungsverfahren**

AoGF Gesuchstellende sind grundsätzlich zufrieden mit den für sie sichtbaren Aspekten des Evaluationsprozesses (Kommunikation und Hilfestellung des SNF bei der Gesuchseinreichung, Benutzerfreundlichkeit, Klarheit der Begleitinformationen, Qualität des Feedbacks, Transparenz und Geschwindigkeit des Auswahlverfahrens). Etwa ein Viertel aller SNF Gesuchstellenden glaubt, die Kennzeichnung eines Projekts als aoGF habe einen direkten Einfluss – positiv oder negativ – auf die Erfolgchancen.

Ein erfolgreiches Gesuch muss in allen Evaluationskriterien als zufriedenstellend und in einigen als herausragend beurteilt werden. Bei aoGF Gesuchen kann der Aspekt des ‚broader impact‘ gewisse Schwächen in anderen Bereichen kompensieren, oder aber, falls der ‚broader impact‘ nicht überzeugt, ein zusätzlich negatives Element sein. Die Mitglieder des Forschungsrats und der Panels sind in der Lage, den Aspekt der ausserwissenschaftlichen Bedeutsamkeit von aoGF Projekten in die Begutachtung mit einzubeziehen.

Der Unterschied zwischen aoGF und GF Erfolgsquoten kann nicht nur durch die Herkunft der Gesuche (Forschungsinstitution) oder durch disziplinspezifische Aspekte erklärt werden. Stattdessen stellen wir folgende Gründe für die geringere Erfolgsquote von aoGF Gesuchen fest: übermässige Anwendung wissenschaftlicher Indikatoren (z.B. h-index) zur Beurteilung des Leistungsausweises; mangelnde Sicherstellung eines Verfahrens, welches die Diskussion über den ‚broader impact‘ von aoGF Gesuchen in den Panels und im Forschungsrat gewährleistet; Annahmen der Gesuchstellenden, dass Ähnlichkeiten zwischen aoGF und anderen Programmen besteht (was zu Gesuchseinreichungen im falschen Instrument führen kann); höhere direkte Abweisungsquote bei aoGF Gesuchen; mangelnder Bezug von praxisnahen Gutachter/-innen; Unterrepräsentation von Referent/-innen aus nicht-traditionellen Forschungseinrichtungen wie FH und PH.

### **Zukunft und Handlungsempfehlungen**

Das aoGF Instrument und die entsprechende Berücksichtigung der ausserwissenschaftlichen Bedeutsamkeit wird von vielen Stakeholdern als positiv bewertet und die Resultate dieser Studie weisen darauf hin, dass keine grösseren Anpassungen nötig sind. Der Anteil an aoGF Projekten kann künftig noch zulegen, da die meisten Gesuchstellenden erwägen, weiterhin aoGF Gesuche zu unterbreiten. Viele aoGF Gesuchstellende erwähnten auch, dass ihr Forschungsunterfangen ohne SNF Gelder nicht realisierbar gewesen wäre.

Dennoch lassen die Erkenntnisse unserer Studie Verbesserungspotential erkennen, unter anderem: Notwendigkeit einer klar formulierten Definition von aoGF (basierend auf der in diesem Bericht entwickelten Typologie) inklusive klarer Trennung zwischen aoGF und BRIDGE/KTI; vollständige Implementierung der vom SNF unterzeichneten ‚San Francisco Declaration on Research Assessment‘; Optimierung der Diversifizierung des Gutachter- und Referentenpools; Erweiterung der erlaubten Länge des Forschungsplans für aoGF Gesuche für die Darstellung des ‚broader impact‘.



## Résumé

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L'introduction d'une catégorie « recherche fondamentale orientée vers l'application » (RFOA) dans le principal instrument de financement du Fonds national suisse de la recherche scientifique (FNS) a été un choix ambitieux, qui a renforcé la capacité du FNS à financer une recherche fondamentale (RF) ayant en plus un apport pratique.

Vingt pour cent des projets soumis au FNS sont déclarés RFOA par leurs auteurs. Le taux de réussite de ces projets (38%) est sensiblement inférieur à celui des projets RF (54%), même si ces proportions varient quelque peu selon les thématiques et les types d'établissements.

### Définitions et caractéristiques

La RFOA est avant tout de la recherche fondamentale, mais les projets financés ont un double objectif : résoudre ou améliorer la compréhension de problèmes pratiques d'une part et d'autre part contribuer à l'avancement scientifique. Cela peut rendre ces projets plus difficiles à concevoir.

Les projets RFOA produisent un peu moins de résultats académiques que les autres: 88% d'entre eux en produisent au moins cinq (articles dans des revues internationales évalués par des pairs, communications lors de conférences, etc.), contre 93% pour les projets RF. Cependant, ils produisent davantage de résultats non-académiques (brevets, modèles, rapports, guides) que les projets RF. Les projets RFOA conduisent souvent à l'obtention d'un financement supplémentaire après la fin du projet, provenant de différentes sources. C'est toutefois moins fréquent que pour les projets RF.

### Processus d'évaluation

Les requérant-e-s de la RFOA sont largement satisfaits des aspects visibles du processus d'évaluation des requêtes (clarté, conseils et soutien du FNS, facilité de la procédure du dépôt du projet, rapidité de la prise de décision). Environ un quart d'entre eux pensent que sélectionner l'option RFOA a un effet direct (positif ou négatif) sur la probabilité de recevoir un financement.

Pour être financée, une requête doit satisfaire de façon adéquate tous les critères d'évaluation et être excellente pour certains. Le « broader impact » de la RFOA peut compenser des faiblesses mineures d'autres dimensions du projet, sauf s'il est jugé comme médiocre (dans ce cas, cela peut être un handicap pour le projet). Les membres du Conseil national de la recherche et des panels d'évaluation sont satisfaits de la prise en compte du « broader impact » dans leur évaluation.

La différence de taux de réussite entre requêtes en RFOA et RF ne peut être expliquée uniquement par la nature de l'établissement ou par la discipline. Parmi les problèmes dans le processus d'évaluation des requêtes RFOA qui peuvent diminuer le taux de succès, on compte: la surutilisation des outils bibliométriques (h-index) pour juger les prestations des requérant-e-s; l'absence d'un système assurant la discussion du « broader impact » des projets par les membres du Conseil national de la recherche et des panels d'évaluation; la perception par les requérant-e-s que la RFOA dédouble d'autres programmes (entraînant potentiellement la soumission d'une requête erronée); un taux de rejet direct (administratif) plus élevé; un manque d'expert-e-s externes venant de la pratique; et une sous-représentation de rapporteurs issus d'établissements de recherche non traditionnels (par exemple HES/HEP).

### Perspectives et recommandations

L'instrument RFOA et la prise en compte du « broader impact » des projets sont perçus comme positifs et les investigations menées ne conduisent pas à proposer un changement majeur. Le nombre de projets RFOA pourrait croître à l'avenir, car la plupart des requérant-e-s envisagent de postuler à nouveau. Un grand nombre d'entre eux a déclaré qu'ils n'auraient pas pu mener leurs recherches sans un financement du FNS.

Cependant, plusieurs recommandations peuvent être formulées pour remédier aux problèmes identifiés par le présent rapport. Celles-ci incluent la publication d'une définition plus claire de la RFOA s'appuyant sur la typologie développée dans cette étude (et l'ajout d'une distinction explicite entre RFOA et BRIDGE / CTI), une mise en œuvre intégrale de la Déclaration de San Francisco que le FNS a signée, une diversification des experts et examinateurs et l'augmentation de l'espace dédié aux explications du « broader impact » du projet RFOA.

## Introduction

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This report presents the findings of the evaluation of the use-inspired basic research (hereafter UIBR) scheme at the Swiss National Science Foundation (SNSF). It was carried out by Technopolis between July 2016 and February 2017 and has three purposes:

- To assess the understanding of the concept of use-inspired basic research among researchers (applicants), members of the National Research Council (including experts of evaluation bodies) and the SNSF Administrative Offices;
- To evaluate the handling of the use-inspired projects by the SNSF Administrative Offices, external reviewers, members of the National Research Council during proposal submission, external reviewing, assessment and monitoring;
- To develop criteria and recommendations for an appropriate assessment as well as external measures needed.

Our responses to the more detailed set of questions posed by SNSF in the terms of reference for this study are set out in Section 6.2 of the report.

The first section of this report considers the background, uptake, success rate and outputs of UIBR projects at SNSF, in order to provide context and highlight the most important characteristics, successes and shortcomings of this element of SNSF funding. Subsequent sections respectively address the three central aims of this study: to provide an assessment of how the term UIBR is understood in terms of both meaning and function; to assess the evaluation process of UIBR applications from submission to decision; and, consequently, to assess the current situation and possible alternatives in order to formulate practice-oriented recommendations for the future of UIBR funding at SNSF.

This study conforms in full to the evaluation standards set out by SEVAL.<sup>1</sup> Our method for this study comprised:

- 10 scoping interviews (30-45 minutes each via telephone or Skype) with SNSF Research Councilors (hereafter RCs), university representatives and researchers;
- Observation of SNSF Research Council and panel meetings at the SNSF in Bern on 23 August 2016;
- Analysis of uptake & success rates, based on SNSF internal data;
- Two online surveys of SNSF applicants; one of applicants who had submitted at least one application with the UIBR label as main applicant, and another of applicants who had never selected the UIBR option (hereafter 'Non-UI'). Where the same questions appeared in both surveys, we also combined these into an additional survey, reflecting the total population of SNSF applicants;
- 20 interviews on the evaluation process (one hour each, in person or via telephone/Skype) with members of the National Research Council (including panel members) and the SNSF Administrative Offices;
- Content analysis of the 'Broader impact' statements of 100 UIBR applications, as well as content analysis of the comments given in reviewer feedback on the 'Broader impact' dimension of the same 100 UIBR proposals.

More details are appended to this report (see Appendix C), including survey response rates and representativeness, details of interviewees and interview dates, as well as questions asked in the surveys and interview programmes. All appendices to this report are supplied in a separate document.

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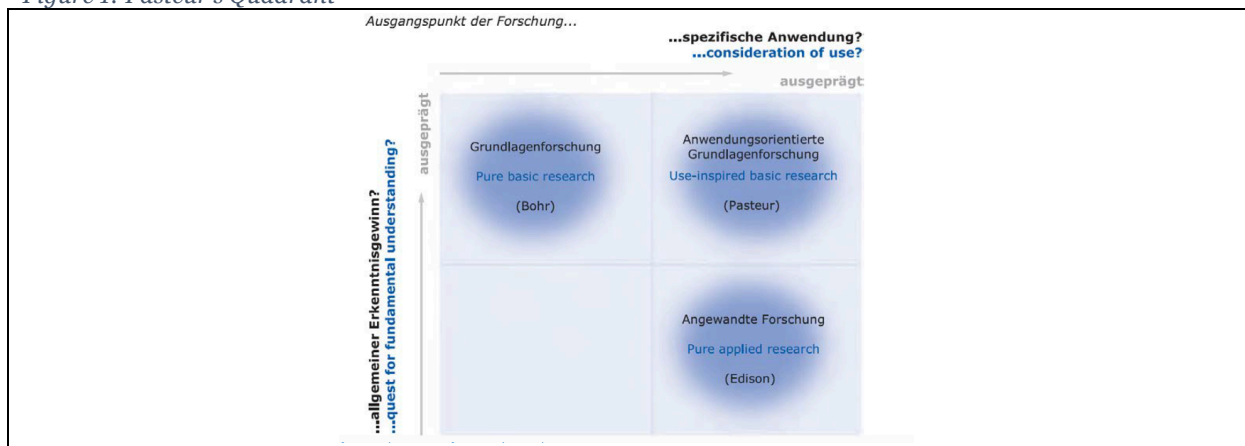
<sup>1</sup> SEVAL (2016) Evaluationsstandards der Schweizerischen Evaluationsgesellschaft. Version 09/09/2016. Available: [http://www.seval.ch/documents/Standards/SEVAL-Standards%202016\\_d.pdf](http://www.seval.ch/documents/Standards/SEVAL-Standards%202016_d.pdf)

# 1 UIBR at SNSF: Context, uptake and success rates

## 1.1 Origins of the term and funding scheme

The term ‘use-inspired basic research’ originates in Donald Stokes’ *Pasteur’s Quadrant*,<sup>2</sup> which criticises the idea that ‘basic research’ is necessarily driven by curiosity or theory alone, as was the case with Niels Bohr’s work. Stokes points out that a lot of basic research is inspired by the uses to which it may potentially be put and offers Pasteur’s research on food safety and health as an example. What distinguishes basic research is that it aims to generate knowledge at a fundamental level, unlike for example Edison’s development of the light bulb, where according to Stokes, Edison was not so interested in obtaining a fundamental understanding of why the light bulb worked as in producing something that actually did. The resulting typology is famously visualised in quadrants (Figure 1).

Figure 1: Pasteur’s Quadrant



Source: Adapted from Stokes D (1997) *Pasteur’s Quadrant: Basic science and technological innovation*. Washington DC: Brookings Institution Press

The original reason for introducing the idea of UIBR concept into Swiss research funding stems from the early 2000s when institutions that traditionally did little or no research – Universities of Applied Sciences (Fachhochschulen), Universities of Teacher Education (Pädagogische Hochschulen), as well as hospitals and various other institutions – were given an expanded research remit. This meant they had to build research capacity and that they were unlikely at first to be able to compete for research funding on a level playing field with cantonal universities or ETHZ/EPFL.

SNSF therefore launched the DORE (DO REsearch) programme in 1999, a special research funding programme led by Division 1 of the SNSF, exclusively for Universities of Applied Sciences (hereafter UAS) and Universities of Teacher Education (hereafter UTE).<sup>3</sup> It was understood that the fields covered by DORE were generally those with a less well established scholarly tradition and greater practice orientation, but where fostering Swiss research expertise was nevertheless important. After a period to allow capacity building it was decided fully to integrate them into the mainstream research funding system. The DORE programme therefore ended in 2011. To integrate the UAS/UTE better into mainstream SNSF funding (they had always been eligible, but did so in very low numbers), and to foster disciplines with an applied component, a new element was then added to the SNSF’s project application system, where applicants (from any institution type) could specify whether their proposed project is

<sup>2</sup> Stokes D (1997) *Pasteur’s Quadrant: Basic science and technological innovation*. Washington DC: Brookings Institution Press.

<sup>3</sup> See e.g. SNSF (2006) *DO REsearch: Förderungsinstrument für praxisorientierte Forschung an Fachhochschulen und Pädagogischen Hochschulen. Tätigkeitsbericht 2004-2006, Fachkommission DORE, Dezember 2006*. Bern: Schweizerischer Nationalfonds.

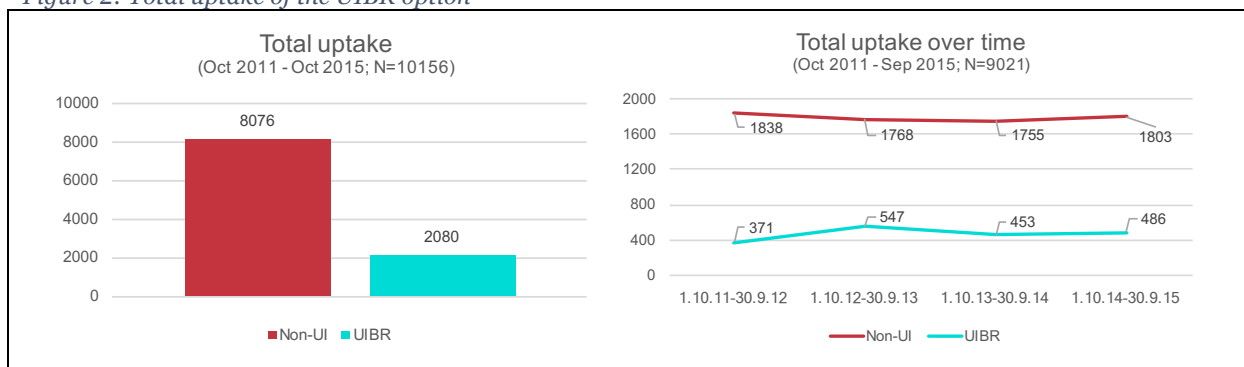
‘use-inspired’. If they selected this option, they could then add a ‘broader impact’ statement to their application in order to further elucidate this dimension.

However, the introduction of the UIBR option was also intended to reflect the increased perceived importance of use-oriented research and non-academic impact and utility in wider society. This trend can be seen in other research funding systems too, for instance in the ‘impact agenda’ of the UK research councils.<sup>4</sup> Further, UIBR fills a gap between basic research financed by SNSF and applied research (involving commercial partners) typically financed by KTI/CTI.<sup>5</sup>

## 1.2 Headline figures: uptake

Based on SNSF internal project data covering all funding decisions from 01 October 2011 to 01 October 2015,<sup>6</sup> 2080 (or 20.5%) of all research project applications to SNSF had been declared as UIBR, while 8076 applications (or 79.5%) had not. These proportions have been broadly constant over time.

Figure 2: Total uptake of the UIBR option



Source: SNSF internal data<sup>7</sup>

Full details of UIBR uptake between subject divisions, institution types, including trends over time, are shown in section B.1 of Appendix B. In brief, we note the following observations:

- Although the UIBR options was in large part introduced due to the expanded research remit of UAS/UTE (from which 358 and 71 UIBR applications were respectively submitted), there is in fact significant uptake of the UIBR option from hospitals (university and non-university hospitals) (421)<sup>8</sup> as well as most notably from the cantonal universities (653) and ETHZ/EPFL (493);
- Within the respective institution types, the UIBR option is used more often in UAS (56%), UTE (56%) and hospitals (38%) than in universities (13%) or ETHZ/EPFL (18%);
- The UIBR option is especially commonly selected in interdisciplinary applications (31%), as well as in Divisions 3 ‘Biology and Medicine’, (24%) and 1 ‘Humanities and Social Sciences’ (21%), whilst

<sup>4</sup> See e.g. RCUK (2014) Impact Report 2014. Research Councils UK; available: <http://www.rcuk.ac.uk/documents/publications/2014impactreport-pdf/>

<sup>5</sup> SNSF (2013) Bericht zur Einführung der Kategorie anwendungsorientierte Grundlagenforschung: Stand nach drei Gesuchseingängen (WS 2011, SS 2012, WS 2012), Juli 2013. Bern: Schweizerischer Nationalfonds; available: [http://www.snf.ch/SiteCollectionDocuments/Web-News/news-131216-anwendungsorientierte-projekte-bericht\\_d.pdf](http://www.snf.ch/SiteCollectionDocuments/Web-News/news-131216-anwendungsorientierte-projekte-bericht_d.pdf)

<sup>6</sup> Nine calls in project funding incl. from 1.10.2011 to and including 1.10.2015 and, in the same time span, four calls in the Sinergia programme.

<sup>7</sup> Total uptake over time excludes the 1 Oct.2015 call, hence the difference between N=10156 and N=9021. This applies to all data on uptake over time presented in this report.

<sup>8</sup> In this report, as the research in university hospital and non-university hospitals is similar, the category Hospital includes both university and non-university hospitals.

fewer applicants select this option in Division 2 ‘Mathematics, Natural and Engineering Sciences’ (16%) and the Sinergia collaborative, interdisciplinary breakthrough research programme (13%);

- Uptake over time is largely stable, except in interdisciplinary work, where the proportion of UIBR applications has increased from 24% to 39% over the four years covered here.

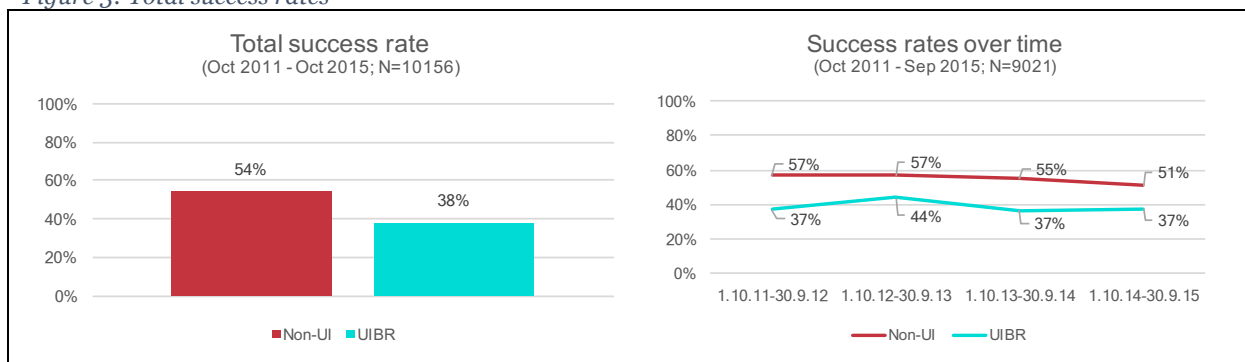
Besides applicants’ affiliations along lines of institution type and SNSF Divisions, further profiling of applicants via our survey (see section B.3 of Appendix B for full data) contributes two further points:

- There are no significant gender differences between UIBR and Non-UI applicants: in each case, around a quarter of applicants are female, reflecting the overall proportion of female researchers in Switzerland.<sup>9</sup> Hence, the observed imbalance is connected to wider systemic factors in the Swiss research landscape, rather than to particularities of either the SNSF or UIBR funding in particular.
- Though some interviewees suggested that the UIBR instrument may appeal more to younger researchers, there is no evidence of a different age profile among UIBR applicants. However, since the UIBR instrument has only existed since 2011, it is impossible to make meaningful comparisons: older applicants might well have used the UIBR option at an earlier age, had the option existed at the time.

### 1.3 Headline figures: success rates

The success rate for UIBR applications in the period analysed is 38%, in contrast to a success rate of 54% for Non-UI applications in the same period. These figures include direct (i.e. administrative) rejections, which we consider separately in section 3.3.1.

Figure 3: Total success rates



Source: SNSF internal data

Over time, the difference in success rates between UIBR and Non-UI proposals has narrowed. However, this is not due to improvements for UIBR applications, but due to a decreasing success rate for the Non-UI projects. This in turn is driven largely by a downward trend in Division 2.

The discrepancy between success rates varies strongly by subject division: whilst the lower rate for UIBR holds in all except the interdisciplinary projects, it stands at 21 percentage points for Division 3<sup>10</sup> and 19

<sup>9</sup> See analysis of ‘Grade A’ and ‘Grade B’ staff in the European Commission’s She Figures report: [https://ec.europa.eu/research/swafs/pdf/pub\\_gender\\_equality/she\\_figures\\_2015-final.pdf](https://ec.europa.eu/research/swafs/pdf/pub_gender_equality/she_figures_2015-final.pdf) (see pages 130-132)

<sup>10</sup> We note that the especially large success rate discrepancy in Division 3 is driven mainly by the Biology rather than the Medicine section of the division (other divisions have sub-panels, though this headline distinction in Division 3 is unique). The figures for this are in Figure 25 in Appendix B.2 These findings will be referred to later on, when we discuss issues such as panel and RC composition.

for Division 2,<sup>11</sup> but only at 9 for Division 1 and 7 for Sinergia. (The full breakdown of success rate data by Division and institution type is shown in section B.1.1 of Appendix B).

Cross-referencing subject divisions and institution types, we can deepen these findings. Table 1 shows the percentage point difference between UIBR and Non-UI applications, subdivided by division and institution type.

Table 1: Success rates by subject division and institution type – UIBR/Non-UI difference

	<b>Division 1 Humanities and Social Sciences</b>	<b>Division 2 Mathematics, Natural and Engineering Sciences</b>	<b>Division 3 Biology and Medicine</b>	<b>Inter- disciplinary</b>	<b>Sinergia</b>
ETHZ/EPFL	<b>-19%</b> (N=216)	<b>-8%</b> (N=1889)	<b>-13%</b> (N=399)	<b>+3%</b> (N=152)	<b>+12%</b> (N=103)
Universities	<b>-10%</b> (N=2133)	<b>-30%</b> (N=1332)	<b>-25%</b> (N=1087)	<b>-9%</b> (N=239)	<b>-11%</b> (N=236)
UAS	<b>-3%</b> (N=398)	<b>-17%</b> (N=129)	<b>-16%</b> (N=53)	<b>+4%</b> (N=54)	n/a
UTE	<b>+12%</b> (N=125)	n/a	n/a	n/a	n/a
Hospitals	<b>+12%</b> (N=26)	<b>+4%</b> (N=19)	<b>-9%</b> (N=973)	<b>+8%</b> (N=42)	n/a
Other research institutes	<b>+17%</b> (N=119)	<b>-6%</b> (N=66)	<b>-15%</b> (N=101)	n/a	n/a
Others	<b>+10%</b> (N=26)	n/a	n/a	n/a	n/a

Source: SNSF internal data, 01.10.2011-01.10.2015, N=10156 (NB: fields where either UIBR or Non-UI had less than 5 successful applications have additionally been marked as ‘n/a’, because even one or two application results could have large effect on the figures shown here). See section B.1.1 of Appendix B for further details on these figures.

In some areas (e.g. UTE, Hospitals and Other research institutes in Division 1; ETHZ/EPFL for Sinergia) UIBR applications have a higher success rate than equivalent Non-UI applications. However, in most places the reverse is the case, especially for Universities and UAS in Divisions 2 and 3. Universities are the only institution type, and Division 3 the only subject division, where UIBR applications consistently have a lower success rate.

#### 1.4 Towards an explanation of UIBR’s lower success rates

The variations in success rate among divisions and institution types suggest that several causes are behind the observed trends, rather than there being a single explanation. Four possible explanations appear relevant.

- UIBR applications come from institution types that have lower success rates overall (i.e. irrespective of UIBR/Non-UI);
- UIBR applications come from disciplines or fields with lower success rates overall (i.e. irrespective of UIBR/Non-UI);
- UIBR projects are at a disadvantage, owing to characteristics intrinsic to ‘UIBR’, such as more challenging research questions or research design and less research-based backgrounds of people likely to propose UIBR projects;
- There is a structural bias against UIBR applications in the SNSF evaluation process (e.g. in terms of criteria, people involved, etc.), or the evaluation process has a built-in difficulty to recognise the merits of UIBR proposals.

The following two main sections of this report will examine the two latter points. However, it is worth considering here the two former points, as their salience can easily be estimated.

<sup>11</sup> As noted, this figure has most recently decreased a little, given the consistent downward trend in Non-UI success rates for Division 2 over the four-year period assessed here

1.4.1 *Success rate discrepancy: institution type as an explanatory factor*

UAS, UTE and hospitals are more likely than others to select UIBR. At the same time, success rates are generally lower at these institution types, both for UIBR or Non-UI applications. Many interviewees pointed out that UAS often have fewer administrative staff (and, indeed, academic staff) with enough experience to support researchers writing a grant application. Time constraints on research (e.g. through teaching responsibilities) are severe in these institutions.

However, this effect can only explain a small part of the observed overall discrepancy, because the difference in success rate also exists in almost all other institution types, which make up large shares of total UIBR uptake. It is particularly worth highlighting in this context that the greatest difference between UIBR and Non-UI success rates occurs for the cantonal universities, not for UAS or UTE.

1.4.2 *Success rate discrepancy: Disciplinary trends as an explanatory factor*

Several interviewees suggested that a possible reason for the overall discrepancy in success rates is the fact that UIBR applications tend to come from disciplines or fields which historically have lower overall success rates, and that this is therefore not an issue with UIBR but with differing discipline or field-specific traditions and norms. Mathematics, for example, has an overall application success rate of 72%, whilst for Sociology the corresponding figure is 39%, whilst UIBR uptake stands at 4% in both astronomy and general history, and at 39% and 40% respectively in civil engineering and law.

To identify whether these variations can explain the overall UIBR / Non-UI success rate differences, we analysed the SNSF data on uptake and success rates for a selection of 32 fields.<sup>12</sup> The full data can be found in section B.2 of Appendix B and yield the following conclusions.

- To some extent, UIBR applications are associated with disciplines that have lower overall success rates; however, this tendency is far from absolute;
- UIBR applications in many cases counteract disciplinary trends. For example, in Ecology, UIBR applications have a 69% success rate, compared to 57% for Non-UI applications; for Sociology, the corresponding numbers are 46% and 38%. UIBR applications' success rates do not correlate well with field-specific success rate trends;
- A high uptake of UIBR applications has no correlation with higher success rates for UIBR. High uptake of Non-UI applications does have some connection with higher Non-UI success rates, but this is not a strong tendency. Fields with a low prevalence, and perhaps little tradition, of use-inspired work do not categorically struggle to assess or reward UIBR applications: UIBR applications can do well even in fields where the UIBR label is not used much;
- Disciplines with high success rates of Non-UI applications can have especially low UIBR success rates, but this is only a slight tendency. Similar to the point above, fields in which Non-UI applications are rewarded especially highly do not necessarily under-reward UIBR applications.

Table 2: Correlations in the analysis of 32 SNSF research domains and disciplines

Relationship	r-value	Correlation strength
Total success rate : UIBR uptake	-0.574	Weak/moderate, negative
UIBR Success rate : total success rate	0.577	Weak/moderate, positive
Non-UI success rate : total success rate	0.980	Strong, positive
UIBR success rate : Non-UI success rate	-0.457	Weak/moderate, negative

<sup>12</sup> We used only those that had at least 100 applications listed in the database (01/10/2011-01/10/2015), in order to exclude bias occurring from small numbers of data points. 39 in total meet this criterion, but we further sought to balance between divisions: 12 were from Division 1, 10 from Division 2, 10 from Division 3. Where interviewees had explicitly mentioned particular fields as having especially high or low UIBR uptake or success rates, we endeavoured to include these, but only where numbers permitted this.

Relationship	r-value	Correlation strength
UIBR success rate : UIBR uptake	-0.112	Very weak
Non-UI success rate : Non-UI uptake	0.549	Weak/moderate, positive

Source: SNSF internal data

These figures indicate that whilst there are substantial differences in terms of UIBR uptake, UIBR success rates and overall success rates between different disciplines, the links between these factors at the discipline level are generally weak and so disciplinary norms are only a small factor behind the overall UIBR/Non-UI success rate discrepancy. UIBR success rates often deviate from overall success rates in their respective discipline.

We also checked at the level of individual disciplines whether there is a relationship between uptake from non-traditional research performing organisations and UIBR uptake and success rates. Whilst we find, once again, a weak to moderate correlation between the proportion of applications from institutions other than ETHZ/EPFL and cantonal universities, and the proportion of UIBR applications, there is no relationship at all between the proportion of applications from such institutions in a discipline and that discipline’s UIBR success rate.

*Table 3: Correlations in the analysis of 32 SNSF research domains and disciplines, by institution types*

Relationship	r-value	Correlation strength
UIBR uptake : Non-ETH/Univ. Uptake	0.448	Weak/moderate, positive
Total success rate : Non-ETH/Univ. Uptake	-0.427	Weak/moderate, negative
UIBR Success rate : Non-ETH/Uni. Uptake	-0.102	Very weak

Source: SNSF internal data

### 1.5 Explaining success rates: a context for the following sections

The data presented in this chapter act as context for the following two chapters, which deal respectively with definitions and understandings of what ‘UIBR’ means and the process by which UIBR is funded at SNSF. We have highlighted that neither institution types, nor discipline or field-specific traditions, nor overall divisional trends can satisfactorily explain the overall lower success rate of UIBR applications. Some of these play a small part in explaining the overall difference, but the absence of any major explanatory factors gives the following sections of this report an added relevance: given the lack of other convincing explanations, the concept of UIBR itself, as well as the details of the process through which funding decisions are reached, are two places where further important factors behind the lower UIBR success rate can be highlighted.



## 2 Use-inspired basic research: Meanings and understandings

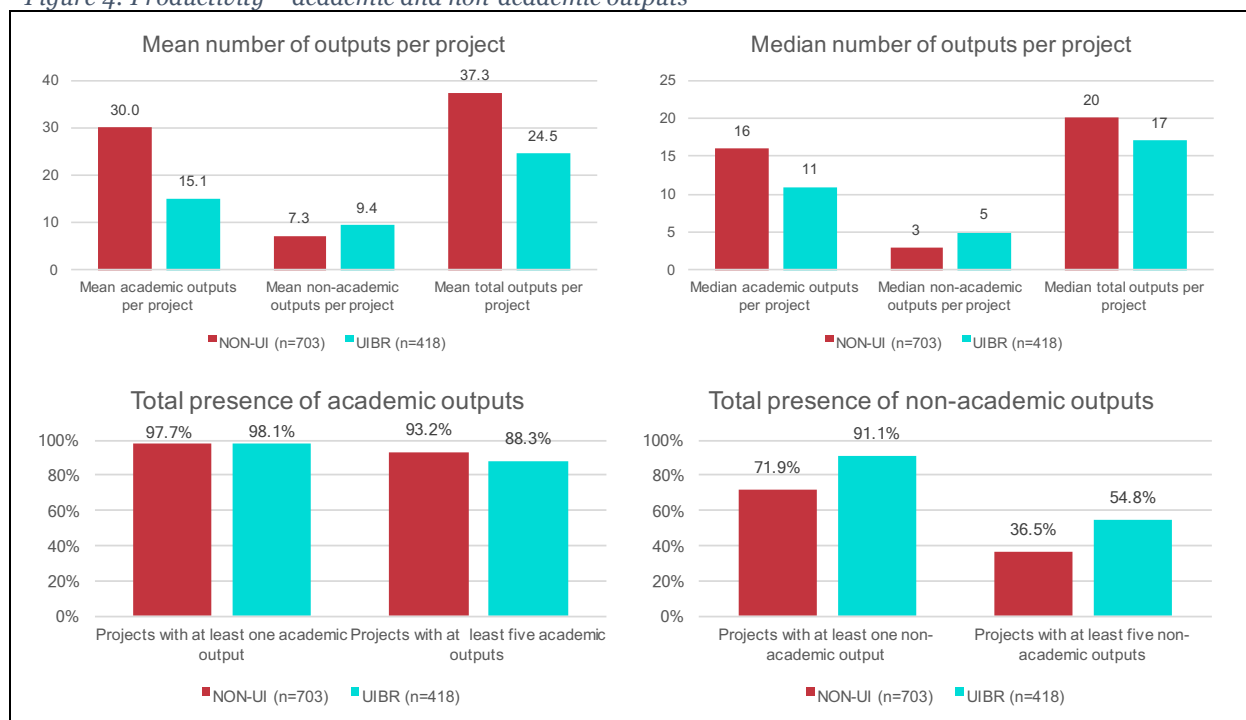
### 2.1 Profile of UIBR grants: outputs and further outcomes

To begin to understand what UIBR might mean in practical terms, it is worth considering what these grants actually produce, and how this differs from Non-UI grants. It is possible that assessors understand that UIBR grants produce different kinds of outputs compared with Non-UI grants and place less value on UIBR outputs.

In our surveys of SNSF applicants, we therefore asked respondents to list the quantities of scientific outputs from their grant, and then to do the same for a range of non-academic outputs. At the overall level, we draw the following conclusions.

- Non-UI projects generally have higher numbers of academic outputs, whilst UIBR projects generally have higher numbers of non-academic outputs;
- However, there are very few UIBR projects with no academic outputs at all, and 88.3% of UIBR respondents report at least five academic outputs;
- Conversely, 71.9% of Non-UI respondents reported at least one non-academic output, leaving a substantial portion of projects with no non-academic outputs at all;
- More than half of UIBR projects captured by our survey data report at least 5 non-academic outputs.

Figure 4: Productivity – academic and non-academic outputs

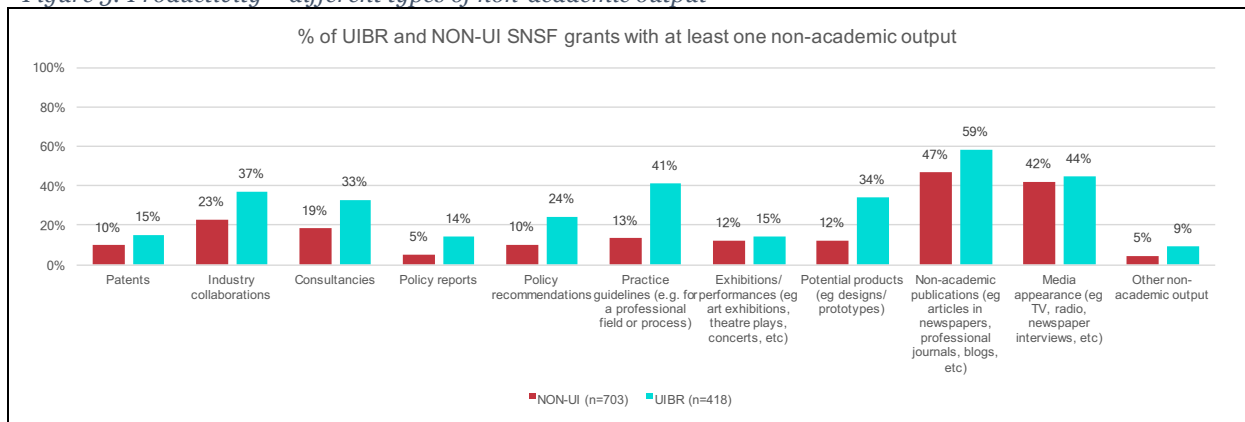


Source: Surveys conducted by Technopolis. NB: we present both mean and median figures, because data of this type can often be skewed by outliers, either in terms of individual projects with unusually high output numbers, or certain disciplines or sub-disciplines where more, shorter publications are the norm. The median value therefore gives a better idea of a more typical project outcome.

In section B.5 we provide a full breakdown of different types of academic and non-academic outputs. UIBR projects stand out in terms of a comparatively high incidence of industry collaborations, consultancies, policy recommendations, practice guidelines and potential products (e.g. designs or

prototypes). Based on our survey findings, we conclude that UIBR grants are highly productive but their productivity is slanted more towards non-academic outputs than is the case with Non-UI projects.

Figure 5: Productivity – different types of non-academic output



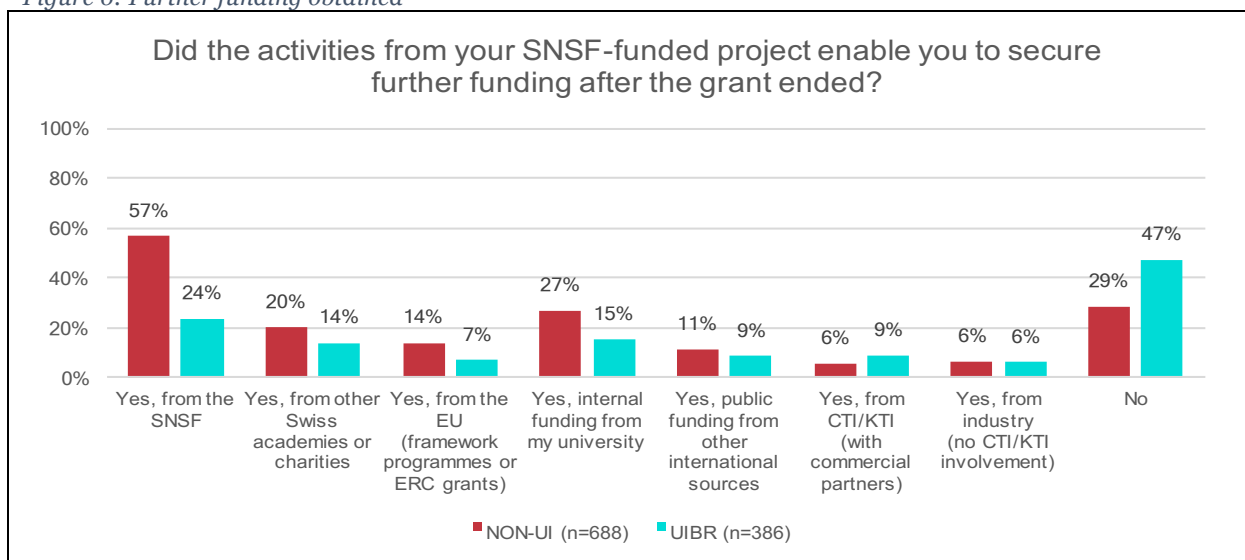
Source: Surveys conducted by Technopolis

### 2.1.1 Further funding and possible duplication with BRIDGE/CTI

As a further measure of productivity and overall significance of projects, we asked respondents to our surveys to note whether their project enabled them to secure subsequent further funding and, if so, from what type of source. This also provides an indication of whether a project existed in isolation, or whether it could be seen as part of a broader, longer-term research agenda.

Responses indicate that 53% of UIBR projects led to some form of further funding, compared with 71% of Non-UI projects. Given that many UIBR projects come from non-traditional research performing organisations, or may be linked to a particular practice-based situation, such a difference might be expected. But despite these qualifications, around half of UIBR projects do result in further research activities, rather than simply being ‘one-off’ endeavours.

Figure 6: Further funding obtained



Source: Surveys conducted by Technopolis. NB: respondents could select more than one source of further funding, so totals across grant types can add up to more than 100%.

Neither UIBR nor Non-UI finding often leads on to KTI/CTI and industry funding. Many of our interviewees (typically those associated with Division 2) were concerned that the UIBR stream may simply duplicate other technology transfer and innovation-oriented programmes, most notably of BRIDGE.<sup>13</sup> Some interviewees associated with Division 2 also noted that they were aware of instances where UIBR applications were rejected on the basis that their subject matter would be much more suitable for KTI/CTI. The survey data suggest that such cases are probably rare. Though we cannot exclude the presence of some level of duplication, it should also be noted that such cases cluster mainly around Division 2, where more than half of projects subsequently associated with KTI/CTI funding were based (18 out of 34 projects in our survey response).

The SNSF's UIBR funding stream cannot therefore be described as duplicating technology transfer or innovation-oriented programmes such as BRIDGE. Therefore, the question of what precisely UIBR means becomes all the more critical.

## 2.2 Defining UIBR

Throughout our evaluation research for this study, it was evident that the term 'Use-inspired basic research' is a source of some dispute and, at times, confusion. In this section, we present evidence about definitions and understandings of this term. The SNSF states its definition of UIBR as

*...research whose main objective is to increase scientific knowledge, even though the problems it seeks to address are of a practical nature.<sup>14</sup>*

Upon selecting the UIBR option based on these considerations, applicants are then expected to add a 'Broader impact' statement to their application, describing the following aspects of their research:

- Need for research as perceived by practitioners/industry: are there any knowledge gaps? Are innovations and improvements expected?
- Transferability of results: to what degree can research results be put into practice?
- Other potential impacts: in which spheres outside science could the implementation of the research results entail changes and what is the nature of these changes?<sup>15</sup>

Many interviews for this study revealed that a broad definition is necessary, and that it may well be impossible to produce a definition or description of UIBR that applies equally to all divisions, disciplines and institution types. However, many interviewees also voiced uncertainty about their own understanding of the term, or about clarity on the part of the Swiss research community more broadly. Many also said that unclear definitions lead to applications being marked as UIBR, when in fact their subject matter does not warrant this and, conversely, that some applications ought to have been marked UIBR, but aren't. This latter group of applications of course cannot be substantially considered in this study.

Our survey data show that 45% of SNSF applicants are either unsure or do not understand at all what is meant by the term 'UIBR', while only 12% felt they understood exactly what the SNSF means by it. These numbers become more favourable when we consider only those respondents who had actually selected the UIBR option at least once, but even among this group, there is a visible lack of clarity.

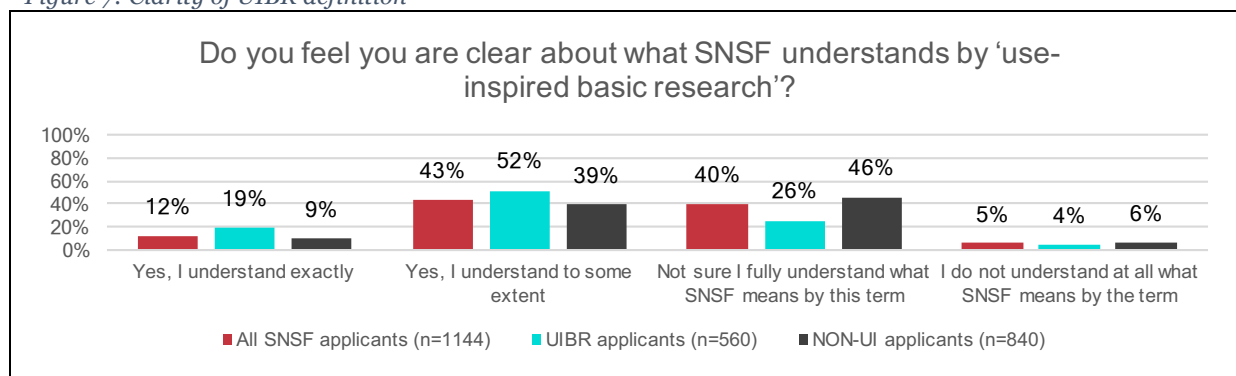
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<sup>13</sup> BRIDGE is a recent programme run jointly by SNSF and KTI/CTI aimed at proof-of-concept and innovation. See <http://bridge.ch/en/>

<sup>14</sup> See <http://www.snf.ch/en/theSNSF/research-policies/use-inspired-basic-research/Pages/default.aspx>

<sup>15</sup> See SNF (No date) Requirements for the Research Plan. Available: [http://www.snf.ch/SiteCollectionDocuments/foerderung\\_projekte\\_howto\\_forschungsplan\\_e.pdf](http://www.snf.ch/SiteCollectionDocuments/foerderung_projekte_howto_forschungsplan_e.pdf)

Figure 7: Clarity of UIBR definition



Source: surveys conducted by Technopolis

The lack of clarity may also affect uptake: in our survey of Non-UI applicants, we asked respondents to note why they chose not to select the UIBR option. Predictably, ‘I did not consider my research to be use-inspired’ was most often selected as a major reason (42.1%), but the second most cited major reason was ‘I was unsure what the SNSF means by ‘use-inspired’ (33.4%) (see section B.8.1 of Appendix B).

### 2.2.1 Towards a definition

In order to define and understand the different possible meanings of this term, and then further test which meanings are most salient, we built on *Pasteur’s Quadrant* and the SNSF’s headline definitions, by asking interviewees in our initial programme of exploratory interviews to explain what they understand by this term. Based on the resulting responses, we compiled a typology, which exhaustively states the various possible generic ways in which a research project may be considered use-inspired.

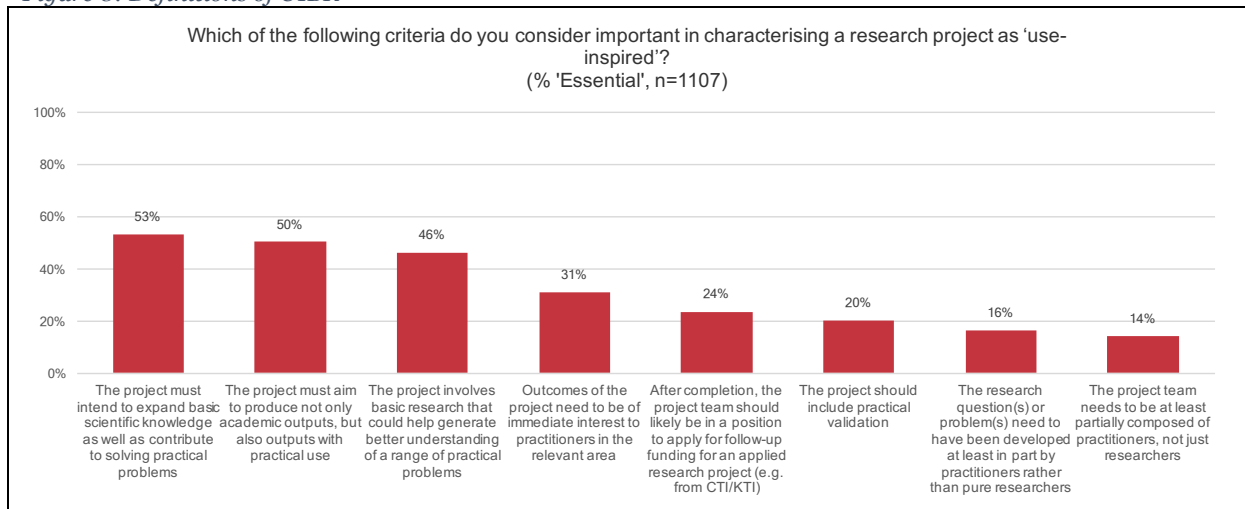
Table 4: A typology of UIBR definitions

UIBR type	Description
<b>Intention</b>	The question here is whether the project aims to produce scientific insights or solve practical problems. ‘UIBR’ would denote the intention to do both.
<b>Output types</b>	Does the project produce academic or also non-academic outputs?
<b>Cognitive/ Conceptual</b>	Derived from Stokes’ ‘Pasteur’s Quadrant’ – The project consists of basic research without caveats, but it may help illuminate (i.e. not directly solve, but contribute to solutions of) a range of practical problems or issues.
<b>Audience</b>	Will results be disseminated only to the academic community, or also to non-academics?
<b>Closeness/ trajectory to application</b>	Does the research form part of a trajectory towards application, validation or technology transfer, potentially in the form of follow-on grants, e.g. through KTI/CTI?
<b>Source of research question</b>	Was the question developed by scientists or did the applicant get to the research question by means of interacting with a user community?
<b>People involved</b>	Is the research team composed of scientists only, or does it include practitioners?

Source: Technopolis

We then converted this typology into a survey question, which we addressed to both UIBR and Non-UI applicants. The results show that the first three definition types are seen by the Swiss researcher community as being the most critical. Surprisingly, there are hardly any significant differences in the responses to this question either between UIBR and Non-UI respondents, or along lines of subject division or institution type. There are only small exceptions on the two overall lowest ranked definitions in the typology: applicants from UAS and Hospitals more often than others felt that involvement of practitioners, either in question development or in the research team itself, are essential characteristics of UIBR.

Figure 8: Definitions of UIBR



Source: Surveys conducted by Technopolis

Besides the views of the broad researcher community, we also sought to understand to what extent these various definitions materialise at the point of application. We asked UIBR applicants directly in our survey to choose the main reasons why they opted to select the UIBR option from a list of twelve possibilities. Full data on this survey item are presented in section B.8 of Appendix B. In brief, the reasons most often rated as most significant were:

- My research question(s) stem(s) from a problem or challenge in the practical world (47%);
- My project intended to generate knowledge of general scientific value, as well as knowledge of practical value (41%);
- I felt my research may be of interest to practitioners (e.g. industry or public sector partners, non-academic professionals in the relevant field, potential end-users) (24%);
- My project aimed to have both academic outputs (e.g. articles in academic journals) as well as non-academic outputs (e.g. designs, policy guidelines, prototypes, etc.) (22%).

To cross-reference whether these motivations hold in the applications themselves, we applied the same typology as a coding frame in our content analysis of 100 UIBR applications' 'Broader impact' sections (random sample, stratified by outcome, divisions and institution type). This additional step highlights a similar picture: almost half of 'Broader impact' statements we analysed follow Stokes' notion of basic research that provides insight into a range of practical problems or domains, without a direct or explicit intention to solve them. The second most common theme in the statements we analysed is intention to solve or contribute to the solution to one or several practical problems.<sup>16</sup> The third most common theme, which initially appears to be a deviation from the results shown in our survey data, is a description of closeness or trajectory towards application of the research. However, this rarely related to a technology transfer or innovation process, but instead often involved descriptions of the next steps necessary after the research ends to ensure the research results materialise into practical use or application in a practical setting (e.g. product development/ professional practice, etc.). In this sense, the category of closeness to application often centres more on how, after the research project, the practical problem(s) in question will be solved.

<sup>16</sup> We distinguished this in our analysis by coding under this category only those statements which involved a description of a particular problem, rather than stating several problems or areas to which the research may apply.

Table 5: Applications analysis – ‘Broader Impact’ statements and the UIBR typology

Coding category	Total
Cognitive/ conceptual (description of relevance to various non-academic fields or problems)	43
Description of a social/ political/ economic/ etc problem or challenge	37
Description of closeness/trajectory to application	34
Citing of a specific non-academic audience	28
Statement on output types	25
Discussion about people involved in the research	23
[Unclassified]	8
Discussion about the source of question	1
Inclusion of validation	1

Source analysis by Technopolis of 100 UIBR applications. Each ‘Broader impact’ statement could be coded to multiple categories, but never to the same category more than once. See section C.5 of Appendix C for details.

### 2.3 Definitions and difficulties: towards an evaluation of UIBR funding

Though a single, comprehensive definition of ‘Use-inspired basic research’ is not possible across Divisions, disciplines and institution types, our analysis highlights the following:

- In most cases, UIBR is research that is oriented towards problems that exist outside of academia;
- In some cases, it can seek to inform one or a range of practical problems by generating knowledge that can illuminate them, allowing others to better formulate solutions;
- In other cases, it is more directly aimed at one or more specific problems, and aims to produce or contribute directly to solutions;
- UIBR projects therefore more often emphasise non-academic outputs than Non-UI projects, although academic outputs still dominate overall in terms of quantity;
- In some cases, inclusion of validation, or inclusion and direct interaction with non-academic audiences is a part of this, and indeed, the origin of research questions may lie in interaction with non-academic communities.

It also needs to be underlined that UIBR is, foremost, basic research: creation of new scientific knowledge is a central concern. However, UIBR projects have the dual focus of aiming to produce high-quality scientific work *and* illuminate or help solve practical problems; to produce academic *and* non-academic outputs; to be of interest to scientists *and* users. Therefore UIBR applications effectively have two hurdles to surmount (the ‘research’, and the ‘use’), whilst Non-UI projects only have one. Our interviews for this study noted a range of problems that can occur because of this dualism in terms of producing a UIBR project that is comparable overall in quality to a Non-UI project:

- Researchers able to address practical problems sometimes do so because they have practical experience. But this means that they may have less academic experience (and possibly a less impressive academic track record);
- Whilst practitioners may struggle to be fully au-fait with the world of researchers, likewise, academics proposing a UIBR project may struggle to fully comprehend the practical realm which they are trying to address;
- Researchers most interested in practical problems may come from institutions that are more practice-based (e.g. UAS, UTE, Hospitals) and are less experienced in supporting SNSF applications and projects;

- Practice-based questions may not readily lend themselves to a feasible and optimal research design. Non-UI research questions in contrast may often already be designed with the existing possibilities of the laboratory in mind.

Some of the difficulty in terms of the UIBR success rate may well stem from this problem intrinsic to the very concept. This adds weight to the importance of the process evaluation in the next section of this report. An important meta-question here is how well the SNSF proposal evaluation process anticipates or deals with the duality of UIBR.

### 2.3.1 *A note on perceived barriers*

Before addressing the assessment process directly, it is worth noting that we asked applicants to rate a set of possible barriers to UIBR in terms of severity. The full breakdown of results to this survey item is appended to this report (see section B.7 of Appendix B). We note the following results:

- Firstly there is a perception that the peer review process at SNSF is not suitably equipped to assess or reward UIBR, as reviewers are seen to struggle to reward broader impact, or to be insufficiently practice-based to be able to properly assess this dimension;
- Secondly, there is a view that narrow assessments of publication records cause problems for UIBR, including in terms of the potentially more interdisciplinary nature of UIBR, leading to publication-related disadvantage;<sup>17</sup>
- Finally, both successful and unsuccessful applicants see the very nature of UIBR as a barrier: UIBR may in many cases be harder to design and conduct due to a range of additional problems that Non-UI projects are less likely to encounter.

These findings are worth keeping in mind for the next section, where we show to what extent these perceived problems materialise within the evaluation and funding process at SNSF.

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<sup>17</sup> Problems around metrics (including journal impact factors) have been the subject of much research and debate. See e.g. Wagner C, Roessner D, Bobb K, Klein JT, Boyack K and Keyton J (2011) Approaches to understanding and measuring interdisciplinary scientific research (IDR): A review of the literature. *Journal of Informetrics* , 165, 14-26. Rafols I, Leydesdorff L, O'Hare A, Nightingale P and Stirling A (2012) How journal rankings can suppress interdisciplinary research: A comparison between Innovation Studies and Business & Management. *Research Policy* , 41, 1262-1282. Langfeldt L (2006) The policy challenges of peer review: managing bias, conflict of interests and interdisciplinary assessments. *Research Evaluation* , 15 (1), 31-41.

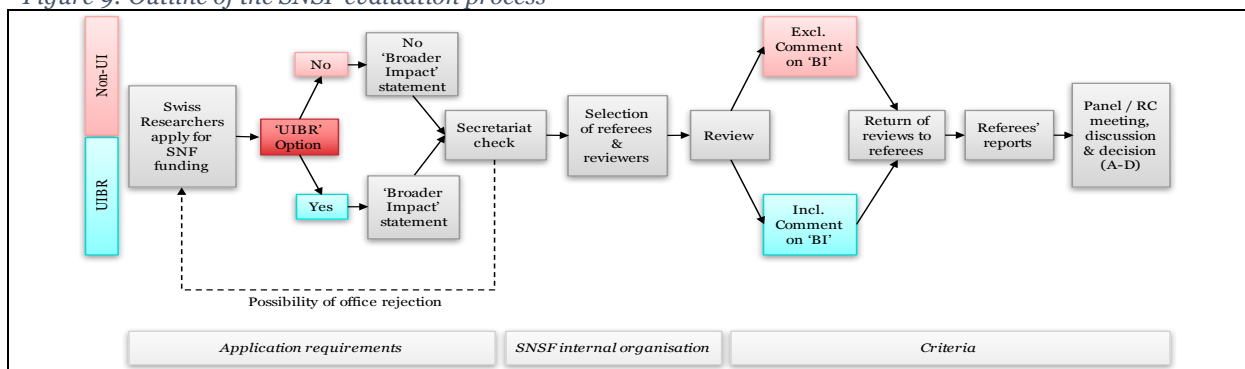
### 3 The SNSF UIBR stream: process evaluation

In this section we present our findings on the process of evaluating UIBR project proposals at SNSF. Where relevant, we contrast this directly to the Non-UI evaluation process, from which the UIBR process only deviates in a small number of aspects. We also note here at the outset that while the overall process is broadly identical, there are several important differences between the three SNSF subject divisions.

The process from application to funding decision at SNSF involves the following steps:

- Applicants submit their proposal through the *mySNF* web portal, which has several standard sections that need to be filled in, including, besides personal and background information, the ‘Research plan’ section, which has a maximum length of 20 pages;
- The UIBR option is part of this online system. If applicants select this option, they need to include a ‘Broader impact’ statement as part of their research plan;
- The application then goes to the divisional secretariat, where it is checked for satisfactory completion. At this point, there is a possibility for a direct rejection, where the application is not forwarded for review. This can result either in re-submission with amendments or outright rejection, meaning only a fully new application can be submitted;
- After successful approval by the divisional secretariat, a main referee and a co-referee are selected from the divisional research council or panel. Referees can note their unsuitability to deal with an application and then have it exchanged for a different one. Applications considered as clearly inadequate by the referee with regard to the relevant scientific criteria are not externally reviewed and are not considered for funding.
- External reviewers are then selected for each application. A minimum of two reviews need to be returned to the referees before the process can continue. For UIBR applications, the review template includes a specific section for feedback on the application’s broader impact;
- The main referee then prepares a report and a recommendation for which grade the proposal should receive, on a scale from A-D;
- The main referee, with the chance for comments from the co-referee, then presents their view at the RC/ Panel meeting;
- Following discussion, the RC/ Panel then either agrees with or modifies the proposed grade for the proposal and may take a vote prior to finalising the grade for the proposal;
- The final funding decision is then taken based on resources; usually proposals rated A-B are funded, those rated B/C or below are not, though this is dependent on how many proposals can be covered by available resources;
- Failed proposals can subsequently be re-submitted.

Figure 9: Outline of the SNSF evaluation process



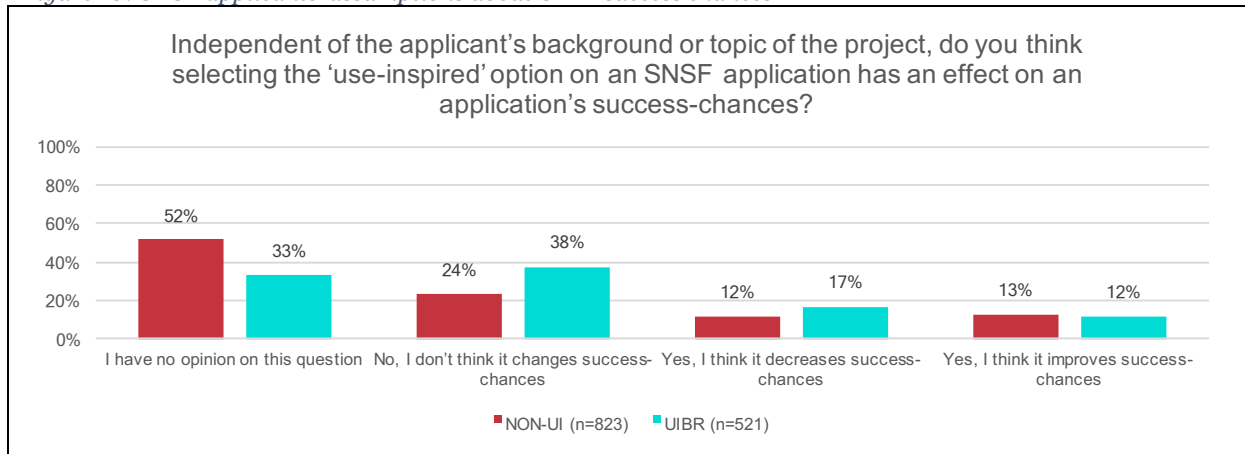
Source: Technopolis



### 3.1 Perceptions and satisfaction

Many interviewees (especially SNSF officers) voiced concerns about possible perceptions among Swiss researchers that selecting the UIBR option has a direct impact on the probability of success. Our survey data indicate that around a quarter of the population assumes this is the case. UIBR applicants themselves are slightly skewed towards negative assumptions here, but broadly the views are split between assumptions of increasing and decreasing success chances. Further, our survey data suggest that assumptions about success play only a minor role in applicants' decision whether to select the UIBR option (see section B.8.1 of Appendix B).

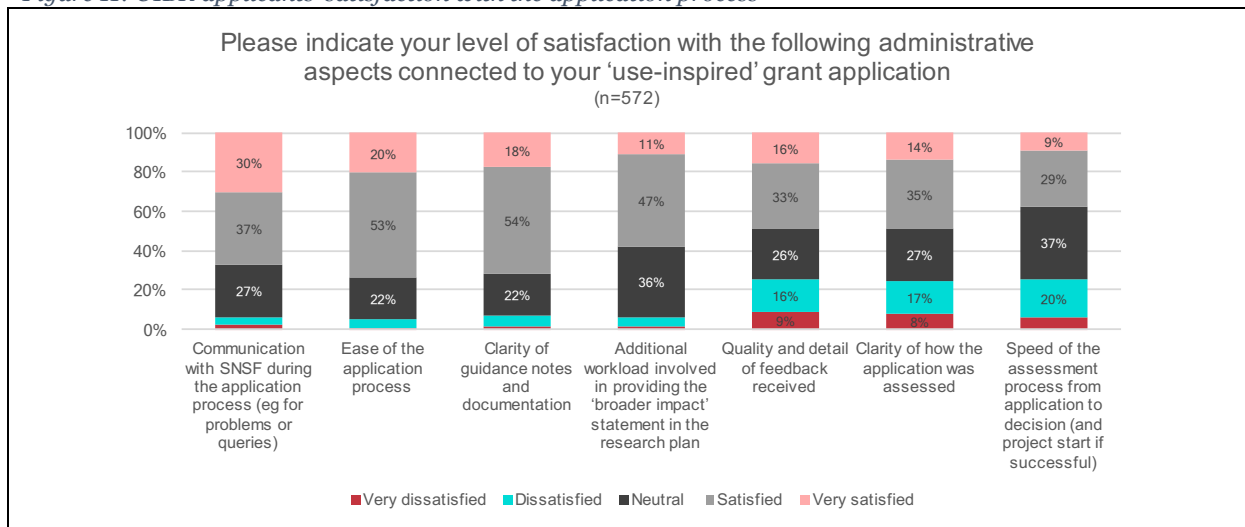
Figure 10: SNSF applicants' assumptions about UIBR success chances



Source: Surveys conducted by Technopolis.

Much of the evaluation process is of course invisible to the applicant. However, we find mostly encouraging results here in terms of the 'outsider' perspective of applicant satisfaction: communication with the SNSF around problems or queries is rated very highly, as is the ease of the application process overall and clarity of guidance notes and documentation. Likewise, the additional element necessary for UIBR applications – the 'Broader impact' statement – does not appear to be a problem in terms of extra workload. We see slightly lower levels of satisfaction with the quality and detail of the feedback received, the clarity of how applications were assessed, and the overall speed of the evaluation process.

Figure 11: UIBR applicants' satisfaction with the application process



Source: Survey of UIBR applicants conducted by Technopolis

### 3.2 The application stage

Our analysis of 100 UIBR applications highlights that the great majority of ‘Broader impact’ statements are around half a page, and rarely more than one full page in length. The statements most often describe specific problems or note a range of problems and fields to which the research is relevant and sometimes also discuss how aspects such as certain output types, people involved or audiences to be addressed will make the research address the problems in question.

Approximately half of the applications we studied have a fully stand-alone ‘Broader impact’ section, whilst the other half have this section as a sub-heading of ‘relevance and impact’ mandatory for all SNSF applications. In some of these cases, the term ‘broader impact’ is not explicitly used (‘academic impact’ and ‘non-academic impact’ is a common approach for structuring), and in some cases there is no sub-heading at all and the distinction within the ‘relevance and impact’ section between academic and non-academic relevance and impact is created only through paragraphing.<sup>18</sup> This different treatment of the ‘Broader impact’ statement on the part of applicants strongly runs along lines of institution type: a clear majority of applications from ETHZ/EPFL or universities opted for a more integrated and less stand-alone section, whereas the opposite is the case with UAS, UTE and hospitals.<sup>19</sup>

Table 6: Broader Impact statement attributes by institution type

Position	Length	ETHZ/EPFL & Universities	UAS, UTE & Hospitals
Stand-alone ‘Broader impact’ statement	Less than half a page	7	<b>13</b>
	0.5-1 page	2	<b>11</b>
	1-2 pages	1	2
	2 pages or more	0	0
Sub-heading under ‘Relevance’ or no subheading	Less than half a page	<b>18</b>	4
	0.5-1 page	<b>17</b>	8
	1-2 pages	4	4
	2 pages or more	0	1

Source: analysis of 100 SNSF UIBR applications and feedback by Technopolis

UIBR applicants from non-traditional research performing institutions therefore tend to give the broader impact component of their application a more clearly marked place. Secondly, there does not appear to be a shared understanding of how the ‘Broader impact’ statement should be presented as part of the application.

A further point derives from our interviews: several SNSF staff noted that the 20-page limit for the research plan is strictly respected. UIBR applicants therefore effectively lose up to one page (occasionally more) of allowed space. As the ‘use’ component of UIBR is very much additional rather than alternative, and may in some cases even complicate the research design, the ‘Broader impact’ statement should either be a separate section with a separate page-limit, or the maximum length for the research plan should be increased to 21 pages for UIBR applications.

<sup>18</sup> In a small number of cases even the paragraphing did not enable a clear separation between academic and non-academic impact. It was impossible to code these cases within this coding frame, so the totals here add up to 92 rather than 100.

<sup>19</sup> We also find variations at the levels of divisions, where stand-alone Broader Impact statements predominate in Division 1 whilst more integrated approaches are more common in Division 2 and ID/Sinergia. However, these tendencies are not as clear as they are with institution types, and the more qualitative approach of this part of the analysis does not lend itself to robust conclusions on this matter

### 3.3 Secretariat check

Prior to the reviewing and refereeing stages, applications are submitted to the divisional secretariat. Here there are two elements that require attention: firstly, the rate of rejection (e.g. on grounds of ineligibility or incompleteness); secondly, the selection process for both referees and reviewers.

#### 3.3.1 Direct rejection rates

Contained within the success rate data presented at the outset of this report is the additional issue of direct rejections, i.e. applications which do not enter the evaluation process, but are instead rejected directly by the SNSF divisional secretariats, typically for reasons of ineligibility or unsatisfactory completion of sections of the application or because proposals are clearly inadequate with regard to the main scientific assessment criteria. Full details of direct rejection rates are appended to this report (section B.1.2 of Appendix B). As with the overall success rates, there are significant differences between UIBR and Non-UI, subject divisions and institution types. The following points about direct rejection rates should be noted:

- Overall, UIBR applications have a slightly higher direct rejection rate of 8% compared with 5% for Non-UI applications;
- The highest discrepancies are in Divisions 2 (Non-UI: 4%; UIBR: 8%) and 3 (Non-UI: 13%; UIBR: 16%), whilst they are minimal in Division 1, Sinergia and for interdisciplinary applications;
- Overall, rejection rates are highest in Division 3 and lowest in Division 1;
- Hospitals, which predominantly have applications to Division 3, also have the highest rejection rate of all institution types.<sup>20</sup> Conversely, UTE have almost no rejected applications, owing at least in part to the fact that UTE applications typically go to Division 1, where rejection is rare;
- Overall, direct rejection rates have seen a marked increase after 2011/12, a trend that is broadly comparable for both UIBR and Non-UI applications, and is therefore due to factors not directly connected with the UIBR funding stream.

The direct rejection rates clearly account for part of the overall discrepancy between UIBR and Non-UI success rates but the numbers involved are so small that this cannot be identified as a major reason for the overall lower success rates of UIBR applications.

While we are unable fully to explain the especially high rejection rate in Division 3, our interviews did highlight that the secretariat in that division includes a check on previous scientific productivity, using bibliometric indicators such as the h-index (we understand that this excludes applications from UAS, but this is just a small share of UIBR applications in Division 3). We have found no evidence of a comparable check in the other divisions, so some part of the higher rejection rate may stem from this.

Likewise, erroneous application, where the distinction between UIBR and, for instance, CTI or translational/ clinical research, is not fully understood by applicants, was noted as an occasional reason for rejection at this stage.

A further possible reason is that UIBR applications tend more often to come from individuals with a more applied background, or at least from a lower level of consistent experience in SNSF funding applications, regardless of host institution, and are therefore more likely to produce applications with administrative errors, or misjudge their eligibility. This is speculative however; our research does not produce evidence fully to explain the discrepancy at this level.

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<sup>20</sup> Although our interviews indicate that hospitals are more likely to have eligibility problems, the primary direction of causality is definitely not the other way around: since Hospitals overall only make up a small part of Division 3 applications, a high proportion of unsatisfactory applications specifically from hospitals could not possibly explain the overall difference between Division 3 rejection rate and others.

### 3.3.2 Referee selection and representation

The referee selection is relatively straightforward, as Research Councils (RCs) and panels are composed of small numbers of individuals who are known by the secretariat. Moreover, referees are not expected to have extensive expertise on the topic of an application, but should have enough to be able to synthesise expert reviews and make a judgement. We do not find any evidence that this process is problematic. The system of a ‘Börse’, where referees can exchange applications if necessary, appears to work well. There is, however, a degree of under-representation of referees from non-traditional research performing institutions.

Whilst UIBR applications come from all institution types, UAS, UTE and hospitals (incl. university and non-university hospitals) are strongly represented among UIBR applicants. In this sense, adequate representation of these institutions on RCs/panels is an important point of investigation.

Of 10156 SNSF applications submitted between October 2011 and October 2015, 22% came from institutions other than ETHZ/EPFL and cantonal universities, whilst only 15% of RCs/panellists are from such institutions. Under-representation is especially evident in Division 1 (although this does not apply to its Arts and Design panel), in Division 3 (though this is driven by the Biology section), and in the interdisciplinary panel.

Table 7: Research Councillors/ Panellists from traditional vs. non-traditional research performing institutions

Division	% of applications from institutions other than ETHZ/EPFL or universities	% of RCs/Panellists from institutions other than ETHZ/EPFL or universities
Division 1	23%	15%*
Division 2	7%	8%
Division 3	40%	24%
Interdisciplinary	24%	10%
Sinergia	16%	13%
Totals	22%	15%

Source: SNSF internal data. Data exclude RCs/panellists based at institutions outside Switzerland. For full breakdown of these figures, see Appendix B.4 \*We note that the panel for Arts and Design has especially high representation of non-traditional research performing institutions, including some individuals based outside of Switzerland, who are not included in these figures. The overall under-representation in Division 1 therefore does not apply to that particular panel.

It should be noted that these imbalances do not necessarily affect Councils’ or panels’ ability to referee UIBR applications: researchers from ETHZ/EPFL or universities might well have experience in practical fields. However, in UIBR applications from UAS, UTE, hospitals and other research performers, the research occurs in a different institutional context, with different pressures, resources and research cultures, which RCs/panels need to be able to fully understand and represent.

This type of institutional understanding can also not fully be provided by the small number of practice-oriented RCs/panellists based at institutions outside of Switzerland: though these individuals add important levels of judgement capacity to the evaluation process, they do not provide understanding or representation of relevant institutional contexts: universities of applied sciences in other countries may, for instance, have different missions, different status or different availabilities of institutional funding.

### 3.3.3 Reviewer selection

At this stage of the evaluation process, there are important differences between the three subject divisions regarding how reviewers are selected, and the extent to which practical experience becomes a criterion in the search. In Divisions 2 and 3 the secretariat takes a lead role in finding reviewers. Using internal databases, sources cited within the application itself, Google Scholar, Web of Science and other

tools, a list of possible reviewers is compiled, which the referee (with possible support from the co-referee) then uses for the final decision. For Sinergia and Interdisciplinary projects the process is similar. However, in Division 1, it is the main referee who leads the search for reviewers, with support from the co-referee and secretariat if needed. We find no evidence that this distinction affects the evaluation of UIBR applications specifically, but it is worth noting here nevertheless to clearly convey the process.

More significantly, our interviews with SNSF officers revealed that instructions on reviewer selection for UIBR applications vary between divisions: in Division 1, referees are encouraged to find at least one reviewer with a practical background or practical experience for UIBR applications. In Division 2, the possibility and encouragement to have reviewers from practical domains for UIBR applications was acknowledged by our interviewees, though it was also noted that in practice it is very rare that such reviewers are involved. In Division 3 we find no evidence of explicit efforts to find reviewers with practice-based backgrounds for the evaluation of UIBR applications (other than occasionally for applications specifically from UAS).

In all divisions, interviewees noted that it is a challenge to ensure the minimum requirement of two reviews (and recommended three reviews) are ultimately returned for consideration, synthesis and judgement by the referee. This does not appear to be noticeably more challenging for UIBR applications.

### 3.4 Refereeing and reviewing

#### 3.4.1 A note on assessment criteria

Once the reviewing process begins, reviewers need to make considerations around the evaluation criteria. These specifically note that, besides the key criteria of scientific relevance, originality and topicality, suitability of methods and feasibility, as well as the applicant's track and ability to carry out the research, the evaluation should also consider the project's broader impact outside science. However, the reviewer feedback template states that broader impact should be considered *as part of* scientific relevance, topicality and originality, rather than as a separate criterion.<sup>21</sup> Our interviews with both SNSF officers and RCs and panellists confirmed this view.

Our interviewees without exception noted that these generic criteria are broad enough that they can accommodate the question of broader impact. Across our interview programmes, this was in fact one of the areas of greatest consensus. Topicality and originality may encompass a wide array of possible forms so, in general terms, it is possible for an application to score highly on topicality or relevance due to exceptional promise of social impact, rather than, say, breakthrough methodological or theoretical innovation.

This is not to say that there are no problems at this stage of the process (as we discuss below), but it is worth noting that in terms of the assessment criteria themselves, there is much support for the approach of specifying only broad areas for reviewers and referees to evaluate, as this allows a range of possible forms and dimensions of relevance, originality, etc. to be considered and weighed up, with due attention for disciplinary or even field or project-specific particularities. However, it is a different question whether the presence of criteria that are in principle suited to including considerations of broader impact leads to a situation where inclusion and due consideration of this dimension actually occurs.

#### 3.4.2 Reviewing

As part of our analysis of 100 UIBR applications, we also examined the feedback given by reviewers on the broader impact of each application. We coded a total of 260 reviews on broader impact, reflecting an average of 2.6 reviews per application.

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<sup>21</sup> [http://www.snf.ch/SiteCollectionDocuments/allg\\_reglement\\_16\\_e.pdf](http://www.snf.ch/SiteCollectionDocuments/allg_reglement_16_e.pdf)

Around half of the feedback sections we coded are very short: we used the category of ‘5 lines or less’,<sup>22</sup> though in many cases the feedback in this section was a single sentence. We also coded for general character of the feedback, i.e. to classify each feedback section as either positive, negative or mixed.<sup>23</sup> This reveals that feedback given on ‘Broader impact’ sections is of a positive nature in around two thirds of cases.

Where feedback is short (5 lines or less), we found no relationship between the character of feedback and the outcome of applications. More detailed feedback (6-10 lines) carries a stronger association with outcomes: applications that received positive feedback of this length are funded more frequently, whereas negative or mixed feedback of this length was generally given to applications that were ultimately rejected, though this tendency is far from absolute. The full coding data behind these findings are appended to this report (section C.5.2 of Appendix C).

Whilst especially for short reviewer comments on broader impact there is hardly any association with applications’ outcomes, our analysis of feedback does highlight some much clearer patterns around consensus among reviewers. Looking at the consensus between different reviewers’ comments on each application, we find that rejected applications very frequently have mixtures of positive, mixed or negative comments on their broader impact. By contrast, successful applications are in our sample are strongly associated with multiple positive comments.<sup>24</sup> Where disagreements within the logic of our coding frame does occur (‘positive’, ‘negative’ or ‘mixed’ feedback), successful applications tend to have a combination of positive and mixed reviews, indicating at worst a concern about an impact being feasible, rather than dismissal or outright criticism of an application’s broader impact. It is worth highlighting here as well that in our sample, only 2 out of 43 successful applications had no positive feedback on their broader impact, and only 9 out of 43 rejected applications had only positive feedback, despite the overall more positive character of feedback comments noted above.

Table 8: Reviewers’ disagreements on broader impact of applications

	Total sample	Funded applications	Rejected applications
Total sample	86*	43	43
No disagreement (all positive)	34	<b>25</b>	9
No disagreement (all negative <u>or</u> mixed)	8	2	6
Disagreement: Positive and negative <u>or</u> mixed	35	11	<b>24</b>
Disagreement: positive and negative**	14	2	<b>12</b>
Disagreement: positive and mixed**	26	9	<b>17</b>
Disagreement: negative and mixed**	9	1	8

Source: analysis of 100 SNSF UIBR applications and feedback by Technopolis. \*we exclude a small number of applications rejected directly, as well as those with unclassifiable feedback. \*\*Some triple-counting may occur between these three categories: a small number of applications have more than two reviews, of which at least one is positive, one negative and one mixed; these show up in all three.

<sup>22</sup> As statements are in different languages, we use lines rather than words to give a more accurate sense of length. Typically, 5 lines approximate to around 80 words, depending on language, word length and font size.

<sup>23</sup> Where the character of a feedback section could not be unambiguously classified (not even as mixed, which would require the presence of clearly supportive and clearly critical comments within a feedback section), we classified the section as ‘other’. This was very rarely the case. Where the ‘Broader impact’ feedback has been omitted, we classified as ‘none’, which was only the case on four occasions.

<sup>24</sup> We note that looking only at the feedback on broader impact cannot fully explain success or rejection, as other factors will of course be in play. Nevertheless, this aspect specific to UIBR applications does allow us to highlight associations with application outcomes.

Our evaluation is not able to go into the distant and large-scale reviewing process in enough depth to assert causality here. In other words: we cannot say with certainty that positive consensus between several reviewers on the broader impact of the proposed research presents a verifiable cause of an application's success. However, these figures do allow us to conclude, in reverse, that the SNSF's UIBR stream does tend strongly towards applications whose broader impact has been established via consensus of more than one reviewer.

We cannot infer causality, because other processes may be at work. Most notably, reviewers may give favourable comments on broader impact if they are already happy with other aspects of an application. Alternatively, applications that are overall of a high standard may be more likely to also produce a suitable and well thought-out 'Broader impact' section. However, we conducted additional analysis to check for congruence between the theme of the 'broader impact' sections and feedback on broader impact per application (presented in B.9.1 of Appendix B), which indicates, at the very least, that some substantive engagement by reviewers with 'Broader impact' sections does occur.

### 3.4.3 Refereeing

Following the review stage, review templates are sent back to the referees for consideration, synthesis, and write-up of a report and judgement. These reports do not include a section specifically devoted to broader impact, so a systematic coding of these reports is not possible. However, our RC/panel interviewees' comments on the assessment criteria reflect that each individual RC's synthesising efforts are inevitably something of a 'black box': the capacity to view 'broader impact' as one possible constituent part of an application's overall originality, topicality and relevance, and to weigh this up freely alongside other aspects, was almost universally acknowledged by RCs/panellists as being of critical importance.

The refereeing process does of course become visible at the point of the RC or panel meetings, and as part of our evaluation, we observed RC and panel meetings on 23 August 2016. In total, we observed discussion of 34 applications, including 6 UIBR applications, across all three main subject divisions. We coded the discussion points and themes for each one. Appendix C.6 contains the detailed information on this data collection. Chiefly, this observation exercise showed that the 'use' and broader impact dimension of applications had a very low profile as a discussion point. Our further main observations can be summarised as follows:

- In four out of the six UIBR applications, the use-dimension was briefly noted (but not discussed in any detail) as a positive aspect. In one case, the use-dimension was noted as a point of criticism, in that the stated use was too unspecific. In the final case, the use-dimension was not mentioned (i.e. not verbally flagged at all);
- Potential for use beyond the academic world was also noted for five of the 28 Non-UI applications, four times as a supporting comment, once as a critical comment (i.e. the research had no potential applications);
- Across all applications, originality and scholarly significance were most often noted as discussion points in support of applications, along with publication history and background of the PI (including in some cases, most significantly in Division 3, their h-Index). Methodological or theoretical rigour were most often the sources of criticism, along with feasibility of the project (either due to scope or inherent risk). PI's background and expertise was also often scrutinised. There was little difference between UIBR and Non-UI applications in these respects;
- Failure to reach the B+<sup>25</sup> grade or higher was typically accompanied by more discussion of problems around scholarly rigour, for UIBR and Non-UI applications alike;
- Concerns around feasibility were rarely associated with decisions not to fund – an indication perhaps that ambitious or high-risk research proposals are essentially welcomed;

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<sup>25</sup> Application are classified on a scale from A to D, but in order to facilitate the discussion, the SNSF also use subgrade (B+, B-).

- Background and publication record of authors was often a factor associated with success (or failure, if problematic). In Division 3, bibliometric indicators were habitually used; the PI's h-index was noted for every application we observed.

### 3.5 The funding process: conclusions

Overall, we find that, contrary to some views expressed in our interviews, the UIBR/ broader impact dimension does play a part in the evaluation process, specifically at the review stage. The association between multiple positive verdicts on broader impact with eventual application success indicates, alongside other evidence presented here, that this dimension is considered, most often in a positive rather than negative sense. However, there are some important critical points to note, where details of the evaluation process may hinder the success of UIBR applications.

- At the level of referees and RC/Panel discussions and decisions, it is far less evident that broader impact of UIBR applications is given any amplified consideration compared to Non-UI applications. We note the widespread view that the existing generic assessment criteria are considered broad enough to include broader impact as one of many considerations to weigh up, which does obscure somewhat our capacity to fully see how this dimension is considered by referees. However, it is a point of concern that whilst reviewers have a defined obligation to comment on broader impact specifically for UIBR applications (in the shape of a designated section), there is no clear equivalent for referees. Whilst a criteria change for UIBR is unlikely to be necessary, and a separate box for comment on broader impact also not appropriate (given the referees' task to synthesise), a more systematised obligation on referees to consider broader impact for UIBR applications would result in greater visibility of this component at the final stage of the evaluation process.
- Types of outputs have been highlighted as a critical area of difference between UIBR and Non-UI projects, and we see some evidence of consideration of this in the evaluation process. However, despite the SNSF's recent signature of the DORA,<sup>26</sup> there is evidence of the use of research metrics, both at the secretariat check and at the refereeing/ decision stage, most notably in Division 3. Whilst the applicant's background and ability to carry out the proposed research is of course a critical part of the assessment criteria, the use of metrics such as the h-index as a way to assess these components is likely to present a disadvantage to UIBR applications, especially in light of the fact that UIBR projects tend to distinguish themselves by larger numbers of non-academic outputs, and in turn tend to have lower (though still significant) levels of articles in peer reviewed international journals. Where metrics are currently used, a full implementation of DORA and a consequently broader approach to assess the track record of UIBR applicants is therefore an important future step.
- At the application stage, there is a further issue around length of the research plan: this is set stringently at 20 pages, whilst our data indicate that 'Broader impact' sections tend to consist of up to one full page. In this sense, UIBR applications effectively lose one page of space to describe the scientific aspect of their proposed work. This is especially important as our findings suggest that use considerations do not substitute for scientific quality, but are additional to these. An extension of the allowed research plan length by one page would appear to be a suitable solution. Given the expansion of space for research plans due to non-inclusion of reference lists,<sup>27</sup> it may be prudent (and potentially time-saving for reviewers) to opt not for 20 pages (Non-UI) and 21 pages (UIBR), but for 19 and 20 respectively instead.

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<sup>26</sup> The San Francisco Declaration on Research Assessment. See <http://www.ascb.org/dora/>

<sup>27</sup> Until recently, the list of references was also included in the 20-page limit; these may in turn vary in needed length, providing an additional factor influencing available space. More recently, the reference list is separate from the 20-page limit, meaning that the 'Broader impact' statement is an even more singular source of potential space-disadvantage.



## 4 Profile and additionality

### 4.1 Knowledge of comparable alternative schemes

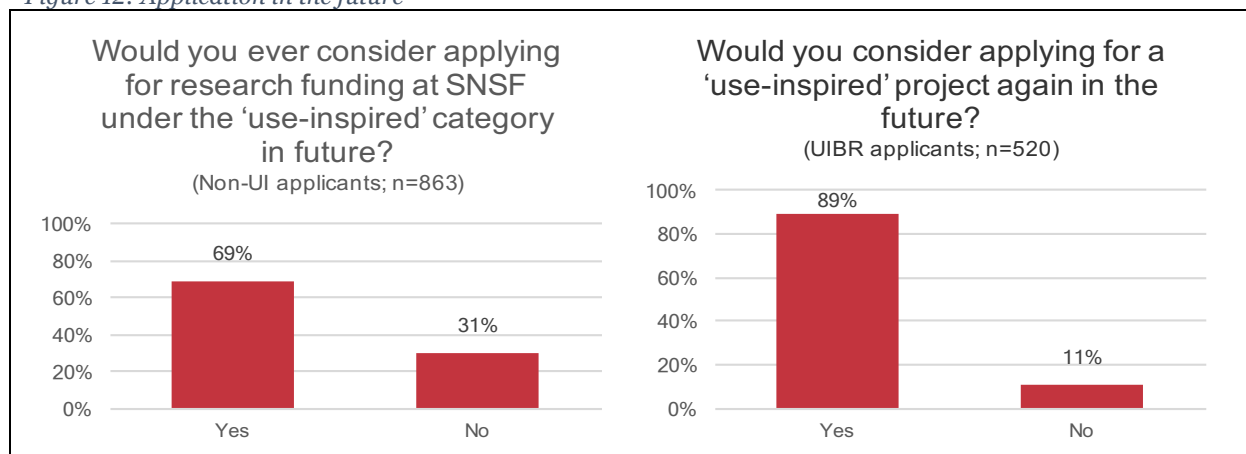
To check whether the UIBR instrument duplicates other available funding tools, we asked all applicants (UIBR and Non-UI) whether they knew of any funding instruments comparable to UIBR. Overall, 79% said they did not, whilst 21% were aware of comparable tools elsewhere. Surprisingly, this figure is identical for UIBR and Non-UI applicants.

However, we find that there are differences between Divisions here: in Division 2, Division 3 and Sinergia, around a quarter of respondents knew of a comparable funding source, rising to 34% for interdisciplinary applicants. But for Division 1, only 16% responded positively to this question (see section B.11 of Appendix B). When we asked respondents to specify these alternatives, the 247 freeform responses obtained cover a broad range of different programmes that cannot usefully be coded or grouped. However, by far the top two alternatives that were stated are KTI/CTI on one hand, and various EU funding sources on the other (e.g. Horizon2020, ERC grants). Respondents from Division 1 almost never mention KTI/CTI, indicating that whilst there is some perceived duplication between CTI/BRIDGE and UIBR, this only applies to Divisions 2 and 3. Furthermore, EU sources are almost exclusively mentioned by ETHZ/EPFL and university applicants, indicating that these prestigious funding options are generally considered out of reach for the non-traditional research performing institutions.

### 4.2 Future perspectives and additionality

89% of respondents in our survey of UIBR applicants said they would consider applying for a UIBR project again in the future. We asked a similar question to Non-UI applicants, of whom 69% said they would consider using the UIBR option in future applications. This indicates that there may be a potentially increased pool of applicants to the UIBR stream in the future, which could likely be realised through clearer explanation and signposting.

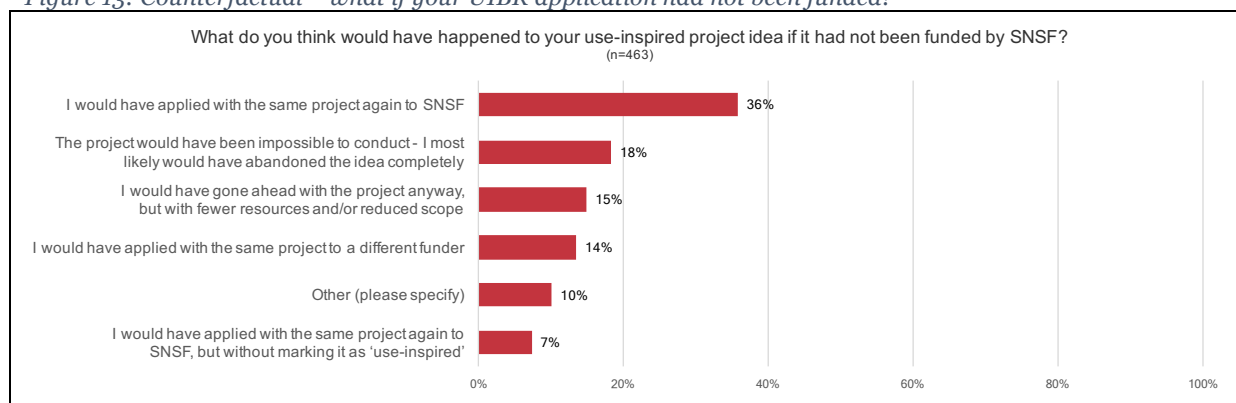
Figure 12: Application in the future



Source: Surveys conducted by Technopolis

Especially considering the above findings on alternative funding sources, it is important to also have an indication of a 'counterfactual', in other words, to ask what would have happened to UIBR projects, had they not been funded. To this question, a third of respondents noted that they would either have abandoned their project idea completely or undertaken the research anyway but with reduced scope and resources. Just 14% noted that they would have tried to find a different funder for the same project. 43% noted that they would have re-applied to SNSF, and only a small proportion of these said that they would have changed from UIBR to Non-UI in the process.

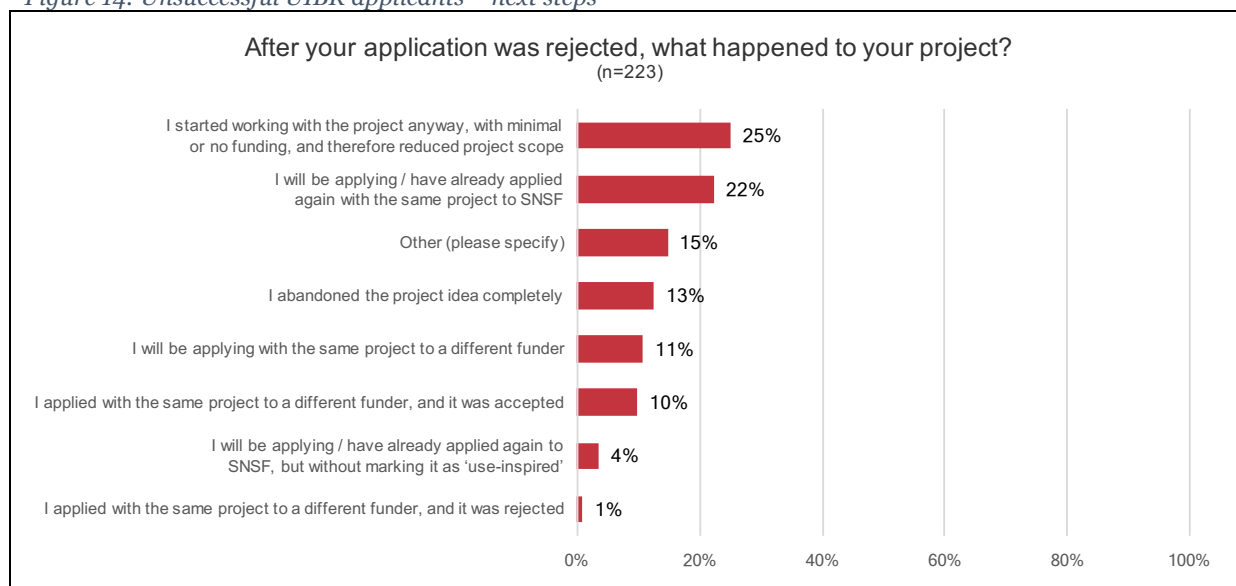
Figure 13: Counterfactual – what if your UIBR application had not been funded?



Source: Survey conducted by Technopolis

We asked a similar question to unsuccessful UIBR applicants, which gives us a similar picture. The proportion of unsuccessful applicants who applied for the same project elsewhere is slightly higher here. There is also a higher percentage of respondents who went ahead with the research anyway but did so with reduced scope and resources and a slightly lower share of individuals who abandoned their project idea completely. The proportion of those considering re-application to SNSF is somewhat lower than in the hypothetical scenarios imagined above, but once again, the proportion of respondents who re-applied without selecting the UIBR option is very low indeed.

Figure 14: Unsuccessful UIBR applicants – next steps



Source: Survey conducted by Technopolis

In addition to the findings drawn so far, we can add that failure to obtain funding is rarely attributed directly to selection of the UIBR option itself. Alternatives to UIBR funding exist, but are only known or used in less than a quarter of cases.

Additionally, these survey data suggest that the UIBR stream funds projects that otherwise would have been abandoned or conducted in a reduced form, meaning that we can confirm a certain level of additionality at this, most fundamental level.

## 5 Funding UIBR: problems and options

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Although UIBR funding at SNSF must be chiefly understood as a positive story in terms of broadening the kinds of research funded and fostering projects that are productive and address problems outside the academic world, our evaluation research has highlighted several challenges around funding of UIBR.

Some problems and challenges identified in this report relate to perceptions and communications that exist between the SNSF and certain institution types, its RCs/panellists or the Swiss researcher community more broadly. Challenges around the definition of UIBR and the kind of research likely to be successful in the SNSF funding process are the most notable examples here. Our interviewees also often noted that a research funder's ability to demonstrate efforts to make parts of its work directly relevant to non-academic concerns has an important political signalling significance, helping to make a stronger case for continued overall investment in science.

In addition to these challenges around definitions and understandings, there are also challenges around the actual process of funding UIBR. Once the 'signalling' around definitions and understandings has taken place, resulting in, for instance, submission of applications from non-traditional research performing institutions, changed opinions or priorities among RCs/panellists, or indeed a change in what kind of research is being proposed, there is then the capacity for problems in funding the types of people, institutions or projects proposed. Here, substantive changes in the SNSF's evaluation process, rather than 'signalling' changes such as dissemination of a clearer definition, are required in order to alleviate barriers encountered by UIBR.

This distinction between signalling and process challenges is critical as a basis for our further discussion and assessment of challenges and future options, which in some respects relate to definitions and signalling, and in others address more concrete process challenges.

### 5.1 The SNSF UIBR stream: a brief re-appraisal

One of the headline observations about UIBR funding at SNSF is that the overall success rate of UIBR applications is considerably lower than that of Non-UI applications. No single factor can satisfactorily explain this. Instead, our findings indicate a range of different factors that are likely to influence this outcome. Some of these apply regardless of subject division, whilst others are specific to certain divisions or more pronounced in some than in others.

- **Inherently more challenging nature of UIBR:** UIBR is most often defined as having two purposes – advancement of science and solution or illumination of practical problems – often expressed in the form of scientific and non-scientific outputs, with high standards needed to be met on both. With two hurdles rather than one, fully satisfactory project applications become less likely. This is compounded by the fact that applicants need to have a solid grasp of 'both worlds'. Furthermore, research questions deriving from practical problems may not lend themselves to robust research design as much as questions deriving more directly from scientific feasibility. To an extent, the lower success chances resulting from this may be a given. However, our research suggests that well-articulated broader impact dimensions can feed into the existing SNSF assessment criteria to compensate, not for inadequate performance in other dimensions, but certainly for lack of outstanding performance in these. Very few applications, as several interviewees stressed, can be outstanding in everything, but should be adequate in all critical aspects, and outstanding in some. Ensuring that broader impact is considered in this way as part of the existing criteria can therefore help tackle this added difficulty of UIBR.
- **Over-use of metrics (e.g. h-index):** The SNSF has recently become a signatory to the DORA, meaning that a broader approach to assessing the background and track record of applicants is necessary. This becomes especially important with UIBR: our findings show that UIBR projects tend to be strong on outputs other than articles in international, peer reviewed academic journals. UIBR projects do also produce such traditional scientific outputs, but assessment of track record needs all

the more to assess track record also in terms of alternative outputs. This issue is only relevant to Division 3 and, to a small extent, to Division 2.

- **Lack of a system to mandate discussion at the referee/RC/panel level:** At the level of referees and RC/panel meetings it is unclear whether broader impact is given any greater consideration for UIBR applications than it is for their Non-UI counterparts. Whilst even for Non-UI applications broader impact is discussed occasionally, there is no process to ensure that the use-dimension is given a greater consideration for UIBR applications at this level. A systematised inclusion of broader impact in referee's reports, or a mandatory discussion point at the RC/Panel meetings would ensure that the special nature of UIBR applications is given attention. This need not be in the form of an additional comment box or criterion, but the question of whether broader impact may change how an applicant's track or research plan needs to be looked at would be an important step to give UIBR applications a noticeable visibility at the refereeing stage.
- **Perceived duplication of other programmes/ concepts (potentially leading to erroneous application):** Given the conclusions drawn in this report about definitions and understandings of UIBR, the conceptual scope for duplication of CTI/BRIDGE is hardly given. However, uncertainty around what UIBR means creates a risk in terms of erroneous application: applicants may apply for projects better suited to CTI/BRIDGE. Likewise, there is some uncertainty around the distinction between UIBR and clinical or translation research. This issue is best tackled by more clarity around defining UIBR and openly stating what UIBR is *not*.
- **High direct rejection rate:** This accounts for three percentage points of the overall success rate difference between UIBR and Non-UI applications, and is driven in part in part by the use of metrics at the secretariat stage (esp. in Division 3). Interviews suggested occasionally that applications more suited to CTI/BRIDGE can be picked up at this stage too, rather than later on at the review/ refereeing stage, which presents an additional known factor. However, there are likely further factors that lead to higher direct rejection rates for UIBR applications, so a closer examination of different divisional practices at this stage may highlight further issues. There is no disproportionate disadvantage for any particular institution type, which suggests that this does not occur due to the lack of adequate administrative support in institutions less familiar with SNSF funding (see below). However, the larger scale of this problem in Divisions 2 and 3 does suggest that erroneous application as a result of perceived duplication of other programmes like BRIDGE (see above) may play a significant part.
- **Applications 'lose' about 1 page of space to outline scientific dimension of their research plan:** This point could be addressed by adding one page to the allowed research plan length or, to avoid this space simply being used for additional scientific description, to mandate it as a separate section. Specifying a set length of up to one page is also likely to discourage applicants from simply selecting the UIBR option and providing only a peripheral few lines: though not especially frequent, many of our interviewees noted that some applications say they are use-inspired, when upon closer inspection this is not the case. This is reflected in a small portion of the applications we analysed for this study, where 'Broader impact' statements were so unsubstantial that the extent of use-considerations behind the project may indeed be questionable.
- **Lack of practitioners as reviewers:** In some fields, where the gulf between research and professional practice is large, this may be difficult, but in others it appears more feasible. Division 1 endeavours to seek input from practitioners or reviewers with some practical experience where possible, whilst in Divisions 2 and 3 this appears not to be the case. It is unclear therefore whether broader impact is understood and assessed with the same rigour and, where applicable, rewarded in the same way as scientific dimensions. This is unlikely to be among the most critical issues, as positive funding outcomes are strongly associated with positive agreement between reviewers on broader impact. Yet, where possible, a more diverse pool of reviewers for UIBR applications would allow more suitable consideration of this dimension.
- **Lack of referees from non-traditional research performing institutions:** A greater built-in understanding of the institutional contexts of UAS/UTE/Hospitals/Other research institutes at RC/panel level may improve the ability to assess the conflicts and disadvantages that can accompany

research conducted with both science and practice in mind. Greater diversity of RCs and panellists may in this sense be a helpful step. Separate panels comprising such institutional backgrounds (adopted briefly in Division 3 when the UIBR category was first introduced) may be an alternative step, though this would run somewhat counter to the overall agenda of better integrating the non-traditional research performers into mainstream funding.

- **No prior experimentation or familiarity with formal UIBR/Non-UI distinction:** In Division 1, and to a lesser extent in Division 3, some preparatory work took place for the introduction of UIBR, meaning that there has been more time and space for referees and secretariat to develop an understanding of how to handle UIBR applications. Although there are of course disciplines in all divisions that have a tradition of use-orientation, such preparatory activities have no equivalent in Division 2. With time, a greater understanding of how to look at UIBR differently may take hold, though a council-level discussion or assessment of how to understand UIBR and include the broader impact dimension more clearly in decision-making may be worthwhile.
- **Presence of applications from non-traditional research performing institutions (e.g. UAS/UTE):** Whilst the issue of direct rejection does not disproportionately affect the non-traditional research performing institutions, there is nevertheless an issue around lack of institutional expertise and experience in writing and supporting SNSF applications. Some interviewees noted that this is not universally the case, and that as little as one single experienced researcher or administrator is able to bring such experience into a research institution and provide a groundstock of support and expertise. With more crossover of staff between institution types, this weakness may be alleviated in future without the need for further direct action.
- **Presence of disciplines/ fields with high UIBR uptake and low overall success rate:** There are significant differences in overall success rate between different disciplines, often within the same division, for a range of historical and cultural reasons beyond the scope of this study. There is a tendency that UIBR applications come from disciplines where success rates are lower, which drives part of the overall UIBR/Non-UI success rate difference. However, it is noteworthy that UIBR applications' success rates are often different from the overall success rate of their discipline. There is no clear pattern in this respect, meaning there is only a loose association between UIBR and overall success rates at the disciplinary level. Whilst some part of the overall difference is driven by this, it is only a small factor.

## 5.2 Defining UIBR: communication and implications

The lack of a clear definition of 'Use-inspired basic research' has been an important theme throughout our study. UIBR is often characterised by dual concerns to produce scientific knowledge as well as to solve or illuminate one or several practical problems. The source of the research question(s) is often in practical concerns, and UIBR projects tend to produce both scientific and non-scientific outputs, with slightly lower rates of articles in academic journals than Non-UI projects, but higher levels of non-academic outputs.

This headline description includes many different aspects, which by no means all apply to every UIBR project in equal measure. Instead, some UIBR projects may only pertain to one of the various facets of UIBR mentioned in this report, others to several. Importantly, they are related to variable combinations of issues that we have noted. Our typology may provide a useful tool, both for applicants to specify how their proposed project is 'use-inspired' and for reviewers and referees to understand how the use-dimension of the application ought to influence the reviewing or refereeing process. We provide an indicative account of this in Table 9.

Table 9: UIBR types – implications for applicants and evaluation

UIBR type	Considerations for applicants	Considerations for evaluation
Intention	Ensure the practical problem(s) to be solved is clearly described (potentially including data demonstrating its significance) and explain how the proposed research will produce or contribute to a solution.	Check for a clear definition and description of practical problems. Assess the significance of the problem and the capacity of the research to help solve it. If so, reward.
Cognitive/ Conceptual	Ensure a range of practical problems or fields are noted and briefly described, and explain how the proposed research will help to illuminate these problems.	Consider the salience of the problems mentioned and whether new knowledge in itself would contribute to their illumination and the ease of formulating solutions.
Output types	Describe what kind of non-scientific output types the project will produce, why these are necessary and demonstrate where possible the ability to produce such output types (incl. through past track record).	If other output types are stated, accept that academic outputs may not be of the quantity you would want in Non-UI. Track record of the anticipated output types may also be worth prioritising over h-index.
Audience	Specify the intended audience of the research other than scientists. Add endorsements, requests or other material demonstrating existing links.	Supporting material indicating interest from the noted audience could help make a case here. Time and resources to communicate with the audience may also be considered.
Closeness/ trajectory to application	Explain how the proposed research would lead to next steps in practical domains. Also explain why CTI/BRIDGE is not the suitable channel for this research.	Possible replication with BRIDGE/CTI should be checked, and the likelihood of stated next steps assessed.
Source of research question	Explain where the question derives from, and explain any unusual methodological challenges arising from the question itself.	Assume that a perfect research design is impossible, or inevitably harder than in lab-driven questions.
People involved	Note any individuals with a partially or fully non-scientific background involved in the project and what merit they add.	Consider all relevant aspects of track record; do not use metrics alone; reward professional experience rather than punishing lack of academic; consider how the involvement of practitioners might be an asset in terms of solving problems/ communicating.

Source: Technopolis

Applying this typology could take many different forms. One would be a highly systematic approach, where applicants may be prompted to ‘please tick all that apply’ and systematically provide a description in each, rather than the current approach of more freeform ‘Broader impact’ statements. Likewise, referees and reviewers feedback could be mandated in such a structured, point-by-point form. Alternatively, a light-touch option would be to simply ensure that this typology and its implications for applicants, reviewers and referees are noted and clearly communicated to all these groups. This latter option is at present likely to be the more appropriate course of action, given the current situation of low understanding, awareness of agreement about the very concept of UIBR. With this starting point, a clear and widely communicated set of definitions is in itself a significant step that will not necessarily need to be complemented by a fully formalised checklist-approach as outlined above.

### 5.3 Looking ahead: towards optimised UIBR funding at SNSF

Looking to the broader context, research funders internationally have made several different efforts and experiments to foster certain types of research. For instance, the ESRC and Wellcome Trust in the UK both introduced multi-stage tools to fund especially innovative research, where the innovative/transformative nature of the research and the more traditional markers of scientific quality are assessed in separate rounds.<sup>28</sup> Others have created such funding tools, but rely simply on modified assessment

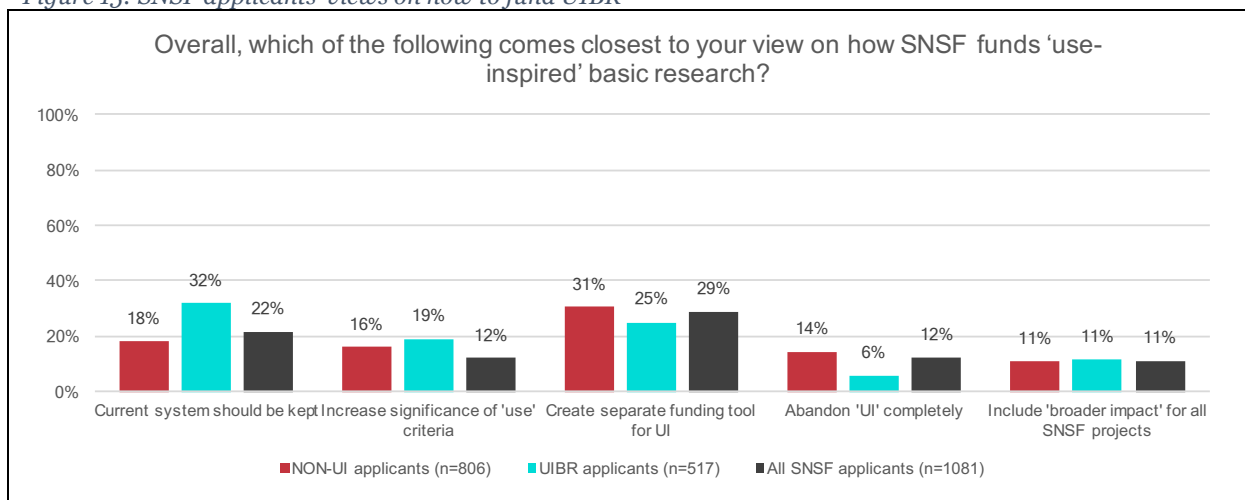
<sup>28</sup> Kolarz P, Arnold E, Farla K, Gardham S, Nielsen K, Rosemberg Montes C, Wain M (2016) Evaluation of the ESRC Transformative Research scheme. Report by Technopolis for the Economic and Social Research Council, UK. Available: <http://www.esrc.ac.uk/files/research/research-and-impact-evaluation/esrc-transformative-research-scheme-evaluation/>; Grant

criteria rather than a substantial process change – The NIH Director’s Pioneer Award programme in the US is an example of this,<sup>29</sup> as is the SNSF’s own Sinergia programme. On the issue of broader impact, the UK is notable in that all RCUK grant applications are expected to include an impact statement, in an effort to increase the overall relevance of research to society.<sup>30</sup> Mindful of this wide array of options, we put some of the basic ‘archetypes’ to our survey respondents, specifically:

- The current system with the option to specify a project as ‘use-inspired’ is good and should be kept as it is;
- The current system should stay as it is, but the assessment criteria for ‘use-inspired’ applications should be modified to place more emphasis on the use-dimension;
- ‘Use-inspired’ basic research should be funded through a completely separate funding tool, competing only with other ‘use-inspired’ applications;
- SNSF should abandon the term ‘use-inspired’ completely and use only its established assessment / evaluation processes without special attention to use-aspects;
- SNSF should demand a ‘broader impact’ statement and consider this in the assessment process for all applications it receives.

The foremost encouraging sign in the resulting survey data is that there appears to be very low appetite to abandon the UIBR instrument completely, and that keeping the UIBR option as it is the most popular among UIBR applicants themselves.<sup>31</sup> However, given the array of different problems and definitions we have highlighted in this report, it is unsurprising that there is no clear consensus among the Swiss researcher community on what future shape UIBR funding should ultimately take.

Figure 15: SNSF applicants’ views on how to fund UIBR



Source: Surveys conducted by Technopolis

Creating a fully separate tool is most commonly selected as the preferred option by the population of SNSF applicants as a whole. However, our interviewees often made the point that this would in many ways be a step backwards: DORE was introduced as a separate programme of mainly use-inspired

J and Allen L (1999) ‘Evaluating High Risk Research: an Assessment of the Wellcome Trust’s Sir Henry Wellcome Commemorative Awards for Innovative Research.’ *Research Evaluation*, 8(3): 201-4

<sup>29</sup> Evaluation key findings available: <https://dpcpsi.nih.gov/sites/default/files/CoC-051413-Pioneer-Award-Program-DP1.pdf>

<sup>30</sup> See e.g. RCUK (2014) *Impact Report 2014*. Research Councils UK; available: <http://www.rcuk.ac.uk/documents/publications/2014impactreport-pdf/>

<sup>31</sup> It is worth noting in this context that we also asked respondents whether they are happy with the term itself, or whether an alternative term might be better. The findings are presented in Appendix B.6 and indicate that keeping UIBR is generally preferable to introducing a different alternative term. At this semantic level, likewise, we therefore do not recommend a change.

research funding for the UAS and UTE, with the long-term plan to integrate these into mainstream SNSF funding. This has now happened and, in a sense, this has in turn changed mainstream SNSF funding itself: many applicants even from traditional research performing institutions select the UIBR option, and a broader range of more diverse research projects with more diverse aims, outputs and contexts is the result. By finding its place in the ‘mainstream’, the notion of UIBR forced important questions, for applicants, reviewers and funders alike, about what ‘basic research’ might mean, and how far this definition might stretch or grow.

Additionally, our research suggests that, whilst there are challenges around UIBR funding, these can be alleviated through minor steps in the evaluation process, as well through clearer signalling regarding the definition of the term. Not least for these reasons, we advise against radical changes such as a ring-fenced scheme or the introduction of a broader impact dimension for all research, and instead recommend keeping the UIBR system in place, but implementing some reforms along the lines described in this section.

#### 5.4 A note on Interdisciplinary research and Sinergia

Many of our discussion points here have centred on the three main SNSF subject divisions. It is worth noting at this point some further considerations for the other two areas that have been included in this study: interdisciplinary projects (ID) and Sinergia.

Interdisciplinary projects have stood out in our findings in that it is the only area where there is no success rate differential between UIBR and Non-UI applications. Interviews also highlighted that for ID projects, the UIBR label is rarely a discussion point and does not appear to be a major matter of concern. In many ways, this reflects the wider literature on interdisciplinary research funding, and indeed, many of the issues highlighted around UIBR in our study are strongly analogous to known issues around ID:

- ID by definition involves bringing together several different perspectives. These may in some cases all be academic perspectives, but the need to compromise and balance between different paradigms is nevertheless a given when taking funding decisions about ID projects. This is analogous to the relationships between academic quality and practical relevance observed with UIBR applications;
- There are documented links between ID and non-scientific impact: interdisciplinary approaches frequently come about precisely because research seeks to address a practical problem or challenge that cannot be sensibly addressed through one disciplinary perspective alone;
- ID tends to struggle to get published in high impact factor journals. More broadly, limitations of research metrics for ID work have been well-documented, so funders are more likely to retreat from metrics-use in this domain.<sup>32</sup>

Many of the issues around UIBR presented in this report will therefore be somewhat familiar to reviewers and referees of ID projects, albeit in modified form. This, in combination with the high uptake of the UIBR option in the ID domain suggests that, whilst some of the recommendations outlined in this report may certainly also be applied here (notably around clarity of definitions), the UIBR instrument is a functional and relatively un-problematic element for the SNSF’s ID funding stream.

For Sinergia, the situation is somewhat different, owing mainly to the recent reorganisation of the programme. Since 2016, the focus of Sinergia has shifted from collaborative research to also including the dimension of ‘breakthrough’ research. As noted in the previous section, funders in other countries have likewise introduced special schemes for breakthrough (or ‘transformative’, ‘radical’, ‘pioneer’)

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<sup>32</sup> See e.g. King’s College London & Digital Science (2015) The nature, scale and beneficiaries of research impact: An initial analysis of Research Excellence Framework (REF) 2014 impact case studies. London: King’s College London; Rafols I, Leydesdorff L, O’Hare A, Nightingale P and Stirling A (2012) How journal rankings can suppress interdisciplinary research: A comparison between Innovation Studies and Business & Management. *Research Policy*, 41, 1262-1282; Wagner C, Roessner D, Bobb K, Klein JT, Boyack K and Keyton J (2011) Approaches to understanding and measuring interdisciplinary scientific research (IDR): A review of the literature. *Journal of Informetrics*, 165, 14-26.



research. This has often proven to be a formidable challenge and typically led to these schemes either having modified criteria, or indeed multi-step evaluation processes.

Additionally, whilst there are clear connections between UIBR and ID, there is no evidence of a relationship between the 'breakthrough' nature of research projects and their practical utility, assuming the 'breakthrough' dimension concerns the scientific level (as is the case in Sinergia) and utility is understood in the non-scientific sense (which is the case with UIBR). A reformed Sinergia programme aiming to fund breakthrough research may therefore struggle to also accommodate the UIBR component. Put simply: it would need to perform two fully distinct functions beyond the identification of scientific excellence typical of mainstream research grant funding, which is likely to lead to complications around weighing up too many different features of a proposed research project.

It is, in principle, possible to apply the recommendations set out in this report to Sinergia as well, and to keep the UIBR option. However, given the considerations above, this may lead to a burdensome array of criteria and considerations for the evaluation process. It should also be noted that, in diametric opposition to ID projects, Sinergia has the lowest uptake of the UIBR option (13%). We therefore judge that removing the UIBR label from the Sinergia instrument is a worthwhile simplification to consider.

## 6 Conclusions and recommendations

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### 6.1 Beyond ‘excellence’

The SNSF introduced the UIBR dimension in 2011 primarily to help integrate researchers from non-traditional research performing institutions into mainstream SNSF project funding, following the end of the DORE programme. However, it almost immediately took on a greater significance than this, with many researchers from ETHZ/EPFL and universities also selecting the UIBR option and discussing the broader, non-academic impact or significance of their work. The result is a diverse range of research projects, most obviously characterised by a different profile of output types but also clearly motivated by a range of concerns and factors other than the pure pursuit of scientific knowledge, though the latter is also a consistent key component.

The UIBR tool allows researchers to consider the wider implications of their research, and as such provides a space for consideration of the multiple purposes and uses of science. In a sense, UIBR poses a challenge to the notion of research excellence, for many years the near-singular paradigm of science funding. Projects that on average produce fewer articles in international, peer reviewed academic journals (a traditional marker of ‘excellence’), but are no less productive when other output types are taken into consideration, pose a clear antithesis in this respect. Where research questions derived from practice pose difficulties for methodological design or clear suitability for established journals and disciplines, serious questions arise around whether research excellence alone can still be a satisfactory unitary paradigm.

The SNSF has therefore taken an important step in allowing researchers to expand the definition of what science and research can be. Nevertheless, the task of maintaining funding for purely curiosity-driven research is critical, whilst maintaining high standards in the scientific appraisal of proposed research is likewise essential. It is unsurprising therefore, that there are challenges around the funding of UIBR, most evidently indicated by its significantly lower overall success rate. We have drawn together in the previous section of this report a range of factors to which this is attributable. We therefore conclude this report with our list of recommendations for the SNSF to consider. However, to ensure clarity, we first return to the evaluation questions set out in the terms for this study and provide brief summary answers to all, drawing on the totality of our evaluation findings.

### 6.2 Summary of answers to the evaluation questions

#### 6.2.1 *Definition and understanding of the term ‘use-inspired basic research’*

- What is the understanding of the concept of use-inspired projects among applicants, the Research Council, experts of evaluation bodies and the SNSF Administrative Offices? Does it mean different things for each party and, if so, where do the differences lie (different normative concepts)?

UIBR has a wide range of possible meanings and dimensions, none of which are necessarily constant across different Divisions, institution types or stakeholder groups. However, across the board, UIBR refers most commonly to research with a dual purpose, focused both on expanding scientific knowledge and either solving or providing valuable information to one or several non-academic problems. Research questions therefore tend at least in part to be derived from such practical problems.

- Can different typologies of arguments be distinguished that might lead a researcher to declare his/her application as use-inspired (depending on discipline and type of university)?

Considerations about success chances or career-related desires to cross over between the research and practice worlds play only minor roles. Chiefly, there are several different aspects of research projects that may combine in any number of ways to constitute ground for declaring a project as UIBR.

- **Intention:** the project aims to produce scientific insights as well as solve (or aid the solution of) practical problems;
- **Output types:** the project aims to produce academic as well as non-academic outputs;

- **Cognitive/ Conceptual:** derived from Stokes' *Pasteur's Quadrant* – the project consists of basic research without caveats, but it may help illuminate (i.e. not directly solve, but contribute to solutions of) a range of practical problems or issues;
- **Audience:** results will be disseminated not only to the academic community, but also to non-academics;
- **Closeness/ trajectory to application:** the research forms part of a trajectory towards application and/ or technology transfer, potentially in the form of follow-on grants, e.g. through KTI/CTI. The proposed project may also involve validation;
- **Source of research question:** the research question derived from a practical concern or was developed by means of interacting with a user community;
- **People involved:** the research team is not only composed of scientists – it also includes practitioners;
- What types of outputs do use-inspired projects generate compared to basic research? What is the impact (e.g. societal or political benefits, technology transfer, etc.) of the promotion of use-inspired research?

One of the most evident distinguishing features of UIBR projects is that they have considerably higher rates of non-academic outputs (e.g. patents, designs, policy recommendations, practice guidelines). They also produce traditional academic outputs, though in slightly lower numbers than Non-UI counterparts. Project-by-project impacts are thus likely wide and varied; a formal impact study would be a useful step to explore this further. Overall, the UIBR stream provides a platform through which the relevance of science to wider society and economy can be considered.

- How has the SNSF informed (internally and externally) about the main elements of use-inspired basic research in the past, and how does it inform at present?

There are problems at present around the definition of UIBR among the Swiss research community, and it is unclear to what extent a heightened focus on broader impact of proposals has been operationalised internally, especially at the refereeing and Research Council level. Clearer explanation externally, as well as clarifications internally to RCs/panellists are necessary steps.

- Success rate: How can the lower success rates of use-inspired applications be explained compared to basic research projects?

The lower UIBR success rates are attributable to a range of factors, many of which can be addressed through the recommendations we set out below. Some of these factors are specific to one or more divisions or institution types, other apply universally. We identify as contributory factors:

- Inherently more challenging nature of UIBR;
- Over-use of metrics (e.g. h-index) (notably in Division 3);
- Lack of a system to mandate discussion of broader impact at the panel/ RC level;
- Risk of perceived duplication of other programmes/ concepts (potentially leading to erroneous application);
- High direct rejection rate (possibly related to metrics use in Division 3);
- Applications 'lose' around one page of space to outline scientific dimension of their research plan;
- Lack of practitioners as reviewers;
- Lack of referees from non-traditional research performing institutions;
- No prior experimentation, training or familiarity with UIBR (notably in Division 2);
- Presence of applications from non-traditional research performing institutions (e.g. UAS/UTE);
- Presence of disciplines/ fields with high UIBR uptake and low overall success rate.

### 6.2.2 Handling during evaluation phases

- Is each use-inspired application declared as such? Is there any reason not to declare a use-inspired project as such or vice versa?

There are some minor problems in this area. Around a quarter of SNSF applicants suspect that selecting the UIBR options might affect success chances, though it rarely plays a major role in their decision to select (or not select) the option. These concerns do not have a clear pattern: some believe chances increase, other believe the opposite. Clearer definitions and transparency of the process would alleviate these concerns.

- What are the specific procedures to handle a use-inspired application at the Administrative Offices? Are there any differences in handling such projects depending on the funding scheme or the research funding divisions?

Fundamentally, project evaluation and added steps for UIBR applications follow the same process throughout the divisions. However, section 3 of this report has highlighted several differences that shed light on the differing UIBR success rates. These include:

- Different levels of metrics-use to gauge applicants' track record;
- Different approaches to reviewer selection in terms of inclusion of practice-based reviewers;
- Different approaches to reviewer selection in terms who leads the selection (referee or secretariat);<sup>33</sup>
- Different practices at the point of secretariat checks.
- Are use-inspired applications assessed by practice-oriented external reviewers and members of the National Research Council coming from universities of applied sciences or universities of teacher education? How do they perceive their roles?

It is critical to note that most UIBR applications do not come from UAS/UTE: researchers from all institution types submit UIBR applications. However, we find that inclusion of practice-based reviewers is rare, and only Division 1 appears to make efforts to find these where possible. There is also an under-representation of RCs/panellists from UAS/UTE.

- How is "broader impact" reflected in the external reviewers' and the Research Council's assessment?

Broader impact of applications is commented on by reviewers in a specially designated comment box. Comments are most often positive and usually short (less than 10 lines). There is an association between a successful application outcome and multiple positive reviews on broader impact. At RC/panel level, it is far less clear whether broader impact is given an elevated position at all as compared with Non-UI applications. The nature of the referees' task, i.e. synthesising several reviews, means that a full separation of broader impact in referees' reports would not reflect their remit. However, there is little evidence that this dimension is absorbed into referees' synthesising efforts at all, and no mechanism to demonstrate that this has occurred for UIBR applications.

- Does the life-time management of use-inspired projects differ from basic research projects?

Across our evaluation work for this study, we find no differences in this respect. Satisfaction rates around PIs' interaction with the SNSF are broadly positive and interviewees did not point to any further issues around lifetime management.

## 6.3 Recommendations

The final four evaluation questions set out in the brief for this study relate to recommendations and courses of action for the future. In response to these, we set out here our full list of recommendations deriving from the findings presented across this report.

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<sup>33</sup> We note from interviews that differences exist in this respect, but that this has not always been the case. We have no evidence to suggest that these differing practices have implications for UIBR success rates, but note them nevertheless in order to convey a clear and comprehensive picture of the evaluation process.

- Our headline recommendation is that the UIBR instrument should be kept as part of mainstream SNSF project funding. It clearly has merit in terms of funding a wide range of productive projects that are different from Non-UI projects both in terms of what they produce, and why they produce it. Neither our evaluation findings in terms of the instrument's current functionality, nor the totality of stakeholder views, warrant a major change such as abolition of the UIBR terminology or the creation of a fully ring-fenced, separate scheme. Minor changes, however, are necessary, as we detail in the further recommendations below.
- A clearer approach to defining UIBR is needed: we suggest adapting the typology developed in this report (see Table 4 and Table 9), allowing applicants to indicate from a range of generic reasons why their project is use-inspired, and attach to this some basic guidance on what, consequently, ought to be included in their broader impact statement. This could also be converted into additional guidance for reviewers and referees, who would then have a better indication of how to consider the broader impact dimension of UIBR applications.
- It is critical for the task of increasing UIBR success rates that the standards on research metrics use defined in DORA are fully implemented. Besides the general salience of DORA, projects seeking to produce non-traditional outputs or working on potentially awkward, practice-based research questions are especially disadvantaged by metrics such as h-indices as a shorthand for assessing an applicant's track record. Though track in producing academic publications is critical, smaller numbers or citation counts should not be a hindrance, if this is compensated for by track on other outputs and activities relevant to the proposed research.
- A clearly defined separation should be drawn and publicised between UIBR and BRIDGE/CTI. The latter are about technology transfer and furthering technology readiness, the former is rooted in basic science and should have as a central aim to further scientific knowledge. Similar clarifications are necessary to separate UIBR from clinical or translational research.
- The space allocated to the research plan and broader impact statement for UIBR applications should be re-considered. Either an extension to 21 pages or a separate 1-page section for broader impact would remove the current disadvantage that UIBR applications face in terms of the space given to outline the scientific component of the research plan. Specifying an indicative or fully prescriptive length for 'Broader impact' sections would also ensure applicants give sufficient thought to this aspect. To slightly ease overall reviewing work, research plans for Non-UI applications could alternatively be shortened to 19 pages. At present, applicants also take different approaches in terms of how closely this section is integrated into the overall 'relevance and impact' section mandatory for all applications: some use a separate main heading, others use only paragraphing to separate broader impact from discussions of academic impact. 'Broader impact' as a separately headed section distinct from discussion of academic impact ought to be mandated to avoid different levels of visibility and 'status' given to this section.
- The assessment criteria do not need to change. The broad criteria currently used at SNSF appear to facilitate inclusion of broader impact as a consideration in overall grades given. However, it needs to be clarified to all RCs/ panellists that the broader impact dimension should be a standard discussion point for UIBR applications. A fully separate comment box for broader impact in referees' reports is not necessary, as broader impact should be subsumed as part of the referees' synthesising task. However, there is a need to clarify the necessity of at least some discussion of how this synthesis took place, i.e. whether the use-dimension adds value to a UIBR application and may explain, for instance, adequate rather than outstanding methodology or theoretical relevance.
- Increasing the diversity of reviewers and especially RCs/panellists would be a useful step in ensuring there is expertise to understand the institutional context from which many UIBR applications come. Due representation of UAS/UTE/Hospitals/Other research institutes would expand this capacity. To be clear: this recommendation does not signify lacking ability by RC/panel members from ETHZ/EPFL or universities to understand certain applications at the topical level. Exact details of where under-representation occurs, and from what institution types, is noted in Appendix B.4 of this report.

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