Culture From a Value Systems Perspective:
A Study of CATCH, an Interdisciplinary Research Project in Fisheries and Aquaculture in Norway

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ABSTRACT
International interdisciplinary projects (IDR) are a microcosm of multicultural landscapes. Through a culture theories perspective, in particular, viewing culture as a system of explicitly and implicitly coded values, this chapter conveys the processes and results of a study that investigates and uncovers the management strategies of an IDR project, CATCH. The study of culture from a value systems approach enables a more subtle and nuanced approach to the analysis and framing of cultural heterogeneity in the context of an IDR project, beyond the often dichotomous, cultural dimensions construct. Due to the multiple actors in an IDR project, the example of CATCH illustrates a more nuanced view of cultural filters that arise from each academic discipline. Using the culture as value systems perspective, this chapter shows how multicultural landscapes and different resulting knowledges can be leveraged towards an integrated worldview when solving challenges in a globalized.

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INTRODUCTION

This chapter addresses the call in this book for new (post-cultural dimensions) perspectives in culture theories. It highlights thematically, the complexity and importance of human relations when working across cultures in the context of Industry 4.0. The example of an interdisciplinary research (IDR) project is used in this chapter, to illustrate how co-dependent relationships are navigated and managed towards a common project goal. An IDR project, in particular one that has university-industry collaborators, is a cognitive, sometimes geophysical spatial intersection of actors and stakeholders who have come together for the purpose of solving a real-world challenge. The processes are necessarily heterogeneous landscapes of cultural filters and constructs of its various actors (individual and institutional). We use an IDR project context as an example of talking about culture as a system of values because an IDR project can be viewed as a multi-cultural microcosm of its own. It offers a unique opportunity to investigate and model a theory of culture that is beyond the current dominant cultural dimensions construct that is usually bounded by a national cultures approach. We aim to illustrate in this chapter, how groups of individuals, each in their own capacity of forefront knowledge and expertise in their field and industry sector, leverage upon the inherently heterogeneous cultural fabric of the IDR project in order to facilitate collaborative effort and action towards a common goal. This chapter views cultural values from a more organic perspective, that of nonlinear dynamics and complexity theory (Capra, 1985; Capra & Luigi, 2014).

Culture as 'System'

Systems thinking began in the 1960s in the field of power engineering when technology was not thought as any single machine but systems, and an assemblage of components originating in heterogeneous technologies (von Bertalanffy, 1968). These ideas took an organic, more ecological turn during the 1980s when applied to the study of emerging ecological paradigms in the fields of biology, behavioural and social sciences.

Advances in technologies shapes our socio-cultural ecological systems, influencing how we live and socialise with each other. The first aspect of systems thinking concerns the relationship between the part and the whole. We are individuals as human beings, yet we belong to various circles (or wholes) of activities and acquaintances in our lives. Language, which is part of human culture and communication for example, is one means of how we create meaning in the different types of activities in which we engage:

> *Individuals are organized in many potentially different ways in a population, by many different (and cross-cutting) criteria… The more complex and differentiated the social system, the more potential groups and institutions there are. And because each group of institution places individuals in different experiential worlds, and because culture derives in part from this experience, each of these groups and institutions can be a potential container for culture. Thus no population can be adequately characterised as a single culture or by a single cultural descriptor*. (Avruch, 1998, p. 17-18)

What can be noted in the various conceptualizations of culture by culture theorists through the decades of work, is how culture can be perceived human socio-ecological system. Whether conceptualising culture as a system of meaning-making (Spencer-Oatey, 2008), or core traditions with attached values (Kroeber & Kluckhohn, 1952) or a type of 'mental programming' that calls to mind culture as 'system' (Hofstede, 1991), what is fundamental to all descriptions is how culture is a living entity that evolves with the people who create and perpetuate its form in the context of use.

Interdisciplinary Research Projects: A Multicultural Context of Work

The past thirty years have seen an increasing awareness and interest in both interdisciplinary research (IDR) between different academic disciplines (Brown, 2018; Metzger & Zare, 1999; Lemaine et al., 1976), and university-industry research collaboration for applied sciences (Banal-Estanol, Macho-Stadler & Perez-Castrillo, 2018; Mascarenhas, Ferreira & Marques, 2018; Scandura, 2016; Dooley & Kirk, 2007; Lee, 2000). IDR refers to the integrative effort in assimilating and using methods, data, tools, concepts and theories from separate disciplines towards a common understanding of a complex socio-ecological challenge, where some scholars tend to equate IDR with transdisciplinary research (TDR) efforts (Stokols et al. 2008; Stokols *et al.*, 2003). This developing interest in IDR as a subject of research is due to realisation that the increasingly complexity in solving global developmental and environmental challenges requires a holistic approach. IDR literature indicates that IDR is viewed as means to the emergence of new disciplines, as well as new knowledge production (Darbellay, 2015; Olsen et al, 2013a; Wesselink, 2009). Still, a continuing challenge to the study of IDR as a field of its own is indeed its multifaceted form (Huutoniemi *et al.*, 2010; Qin, Lancaster & Allen, 1997) with inherent multi-levelled epistemological, structural and affective tensions (Turner *et al.*, 2015), thus, different cultural understandings/approaches to research and research design, and different values. Working processes and academic reporting styles differ between disciplines. Whilst natural sciences could potentially have a one-page report on the results of an experiment, a social science discipline would prefer a twenty-page article that makes valid argumentation for a certain perspective in a study.

While there exists a body of literature that focuses on the evaluation and measurement of the effectiveness of IDR (Fazey *et al.*, 2014; Wagner *et al.*, 2011; Klein, 2008) with various frameworks for structuring IDR (König *et al.*, 2013; Dewulf *et al.*, 2007), what remains under researched is an integrated perspective of IDR studies that leverages on the cultural heterogeneity of the team of researchers who work towards a consolidated worldview (Capra & Luigi, 2014; Francois, 2006). Scholars have also called upon an increased effort in formulating a coherent research framework for

IDR. This is due to that a broadly accepted and utilized research framework with consistently defined terms, concepts and language is yet to be developed (Jahn, Bergmann & Keil, 2012).

Fisheries and Aquaculture Research as a Salient Field for Interdisciplinary Research

The subject of sustainable global food consumption in relation to the fisheries and aquaculture industry sector is particularly salient for IDR framing much due to the fact that global fish consumption is projected towards a 1.5% increase per year in the next coming decades, with global fish production and consumption projected to increase 20% by 2030 (FAO 2018). This study takes the multi-stakeholder IDR project entitled CATCH, set within the context of the fisheries and aquaculture research and business sector in Norway in illustration of how a 'culture as systems' perspective can be used to unfold the multiple stakeholder perspectives encompassed within such an IDR project. It offers a visual conceptualisation of the management of CATCH, an applied sciences industry-university collaboration towards higher quality yield of capture-based aquaculture for cod, towards a pedagogical model of understanding and management of an IDR project in general.

This study addresses the knowledge gap in a unified theoretical framework for the field of IDR studies from a theory of culture perspective. The contribution of this study is twofold that includes, (i) consolidating the theoretical foundational knowledge of IDR through various cultural theories, and by using an empirical example of a project timely situated in a field that is inherently interdisciplinary in nature, with close industry collaboration, (ii) develop deeper insights into the management processes and strategy of an IDR project from a post-cultural dimensions construct theory of culture perspective. The research questions (RQ) addressed in this study spiral (and build) upon each other:

RQ1: How can a post-cultural dimensions construct of culture theory be used to help frame / understand the management processes of an IDR project?

RQ2: Likewise, how can a study of an IDR project help frame a post-cultural dimensions construct of culture theory?

RQ3: By using CATCH as project example, what applied impacts on IDR research can be observed from framing IDR project management strategies through a theory of culture perspective?

Structure of Chapter

The chapter is structured as follows. A general literature review of theories of culture is presented, followed by details of the case example of CATCH as an IDR project. Using elements from CATCH as an IDR project example, the methods section expands on how a post-cultural dimensions construct might be framed towards integrating and leveraging upon cultural heterogeneity towards smoother IDR project management. The methods section is then followed by a discussion of findings / results, its implications for future IDR project management and avenues for future academic research in the field of IDR from a theory of culture perspective. The limitations of the study will also be discussed in the concluding section.

LITERATURE REVIEW: AN INTEGRAL SYSTEMS THEORETICAL PERSPECTIVE TO INTERDISCIPLINARY RESEARCH

We have in the previous section, established how scholars saw culture as a type of system, a values-based system. The culture as system discourse is confluent to the scientific paradigm shift towards the increasing influence of systems thinking that began in latter half of the 1900s as a response to the limitations of Descartes's analytic reason (Capra, 1985; von Bertalanffy, 1968). It was also during the 1960s, with the launch of Rachel Carson's 1963 book, *Silent Spring*, that scholars began to try to

conceptualise the interconnectedness of current and future social-ecological challenges. Strong systems thinking influences saw scholars shift their perspective from viewing the parts to viewing the whole as an open adaptive system, where it is also understood that the whole is greater than the sum of its parts (Capra & Luigi, 2014; Floyd, 2008; Capra, 1997). As such, an integral systems theoretical perspective to IDR inherently incorporates the culture as system conceptualization, where culture as system is seen as part of the larger systems thinking movement in scholastic discourse/thinking.

As example of that the sum is greater than its parts, fisheries and aquaculture research is inherently interdisciplinary and pluralistic in theoretical methods, the purpose of the research findings of which are usually intended to be applied to business sector practices. Challenges set in the context of the fisheries and aquaculture industry are inherently socio-ecologically complex, with a need to balance between socio-ecological and economic resources. Although many business enterprises within fisheries and aquaculture in particular the Norwegian context are born globals, being multinational enterprises, their business narratives continue to be marginal to the international business (IB) community of scholars whose theories focus much more on traditional manufacturing enterprises (Vahlne & Johanson, 2017, 2013; Gibbons, 2005; Grossman & Hart, 1986; Coase, 1937). Different from IB studies, fisheries and aquaculture international business (FAIB) has the task of considering carefully, the social contract between an enterprise and society (Thompson & Valentinov, 2017; Lam, 2016; Villasante et al., 2011).

Several studies that focus on the specific challenges that IDR research face, particularly IDR in the context of sustainability science have shown five key challenges that need to be addressed when doing IDR and university-industry collaboration. The first is (i) the lack of a coherent shared cultural values system is perhaps an inherent challenge for IDR where scientists and practitioners are brought to the project for the very reason of their differing disciplinary heritage, knowledge and discipline background (Pischke et al., 2017). The second is (ii) the lack of an integration of methods between disciplines. Method integration would lead to new knowledge formation at the intersections of society and science in which sustainability challenges can be viewed in novel perspective and perhaps solved through applied innovation (Clark et al., 2017; Szostak, 2015). The third challenge to IDR is (iii) mapping the ongoing research processes and knowledge production so that it can be implemented in context.

Scholars have identified and characterised three types of knowledges in IDR that include, *systemic* (gaining a broad overview of root causes and possible solutions to a socio-ecological challenge), *specific* (such as targeted towards problem solving in context) and *transformative* (knowledge acquired that can change the course of future action towards solving a current challenge) (Adler et al., 2018). What remains is a deeper understanding of how these types of knowledges can be implemented in practice and effectively shared across disciplines (Adler et al., 2018). Perhaps part of challenge to the effective transfer of knowledge not only between IDR scholars but also from scholars to practitioners, could be attributed to challenge (iv), the degree and intensity of practitioner engagement (Pischke et al., 2017). Practitioner contributions to an IDR project might range from *consultant / adviser* (outlining a context-based socio-ecological problem currently faced) to *beneficiary* (if for example a new prototype product is built). The different practitioner roles and industry expectations would mean varying degrees of project participation at different stages of the project. The final challenge characterised in IDR is (v) creating of social impact, where the fabric and landscape of sustainability sciences for example, is so nuanced that what research findings and outcomes intended originally for a broader global reach, is eventually confined to context specific solutions (Mårtensson et al., 2016; Rau et al. 2018).

Whilst there might some ways to go before IDR challenges are resolved, inherent in an integral systems approach to IDR is the capacity to frame perspective relativity. Relativity in perspective is inherently structured in the lexico-grammar (architecture) of almost all human languages (Halliday & Matthiessen, 2014; Chomsky, 2011). In the English language, perspective is reflected in the deictic (pointer) pronoun referencing system of the *singular subjective* (I-perspective), *plural intersubjective* (We-perspective), *singular objective* (It-perspective) and the *plural interobjective* (Its-perspective) (Halliday & Matthiessen, 2014). The grammatical function of pronouns, "I", "We", "It" and "Its" translates into four perspectives that render four different types of knowledge zones (Bowman, 2012; Wilber 2000). It is this four quadrant perspectivising that is the integral systems approach to IDR, reflecting an integral

worldview characterised by plurality in perspectives. For each of these perspectives, reflected in Figure 1, there is a further possibility to reference *interior* (I/We/It/Its perspectives) and *exterior* (You/They/It/Its perspectives) views even if in the English language, the reference words remain as It/Its for singular objective and plural interobjective views. Language in use both reflects and constructs our reality (Whorf & Carroll, 1974). Knowledge zones are created when research studies consistently have as investigative focus, one of these perspectives. As such, Figure 1 also maps 8 major research methodological perspectives (Esbjorn-Hargens & Zimmerman, 2009; Wilber, 2006, 2000).

[insert Figure 1 about here]

Figure 1. Integral four-quadrant model illustrating the English language deictic pronoun referencing system, mapping the 8 primordial perspectives and 8 major research methodological perspectives (Wilber, 2006)

The perspectives visualized in the quadrants in Figure 1 can be seen as holons, moving from narrower to broader perspectives, with each broader perspective encompassing the narrower perspectives. Figure 1 also illustrates examples of dominant type methods of inquiry if consistent scientific inquiry were to be made from the perspectives of *I, We, It* and *Its.* The *singular subjective* perspective is expressed in the Upper Left (UL) quadrant which are *I (interior) / You (exterior).* In the UL quadrant, phenomenology, which is the study of consciousness, experience and intention as viewed from the first-person perspective directed towards an object/entity could be said to be an example of a consistent method of investigation employed in order to uncover knowledge in this quadrant. Also, from the *I* perspective but with an understanding that phenomena of human life have meaning only through interrelations is reflected in the exterior view of *I*, where in some cases the pronoun *You* can be used to make a deictic distinction. Structural anthropology for example, which is the study of human behaviour and societies as having structural patterns and organization is an example of a type of knowledge that can be characterised in the UL quadrant. The *plural intersubjective* perspective is expressed in the Lower Left (LL) quadrant with the pronouns *We (interior)* and *They (exterior)*. In the LL quadrant, a dominant theory and method of investigation for the interpretation of collective texts from society's perspective is hermeneutics, whilst an exterior view of *We* in the study of culture could employ methodologies such as ethnomethodology and discourse analysis of group interactions. Knowledge on in-group and out-group behaviour is characteristic of the LL quadrant, where relationships between social groups are studied and mapped. Going diagonally across Figure 1 from the LL quadrant, the *singular objective* perspective is expressed in the Upper Right (UR) quadrant with the pronouns *It (interior)* and *It (exterior).* While the English language does not make a spelling distinction between the two reference points, these reference points are nonetheless defined when studies are designed, and reflected in their choice of methodology. In the UR quadrant an example of a methodology to acquire knowledge of an interior view of *It* would be where the system is capable of reproducing and maintaining itself are studies on autopoiesis in the fields of chemistry and biology. An exterior view of *It* would employ methods of empiricism where you can observe the entity in part or as a whole, from outside of it.

Most of the western scientific paradigm could be argued to have foundations in empiricism. The knowledge that characterises the UR quadrant is empiricism, and entity autopoiesis. Many statistical empirical studies in the field of IB studies for example, would fall in this quadrant in research design and framing. The combined effects of elements from the UL and LL quadrants in terms of human behaviour exhibited in relation to their environment is also reflected in the UR knowledge zone. The *plural interobjective* perspective reflects knowledge from network behaviour and system studies. This knowledge zone is framed in the Lower Right (LR) quadrant. Investigating system-of-systems, social autopoiesis, network theory and methodology could be said to be dominant methods of inquiry including systems theory. FAIB and sustainability science would for example, be a field of study that consistently employs system/network theories and theories on global governance in their research design and framing. Perspectives and knowledge that characterises the LRL quadrant are necessarily broadest in perspective, encompassing / amalgamating all other perspectives. Figure 1 is an illustration

of how the body of scientific knowledge as a whole is built and/or acquired. In terms of IDR research, the integral systems perspective can help situate / locate the expertise base of the individuals involved in the IDR project, and where for example, their knowledge can be complementary to another field, or applied in a practical context towards problem solving. As such, Figure 1 has two applications. The first is as an IDR mapping tool in order to identify gaps in expertise needed for a context specific IDR project. The second is that it serves as a post-cultural dimensions construct of culture theory, that unfolds the complexity of culture into specific perspectives and environments / circumstances.

CATCH: AN EXAMPLE OF AN INTERDISCIPLINARY PROJECT WITHIN FISHERIES AND AQUACULTURE INTERNATIONAL BUSINESS

Atlantic Cod is a key species in the Norwegian seafood industry. In the years prior to the CATCH project, the share of cod in the total Norwegian export value of all wild-caught fish except mackerel and herring was 43% (NOK 5.6 billion) (Directorate of Fisheries, 2014). Cod is processed into many different product forms (e.g., fresh and frozen fillets and whole fish (headed and gutted), stock-fish, as well as salted and dry-salted cod, i.e. clip-fish) and is exported to a wide range of nations and market segments. The Norwegian domestic market for cod is also important, especially for fresh cod fillets. A key challenge for the cod industry is that many products such as frozen fillets/blocks and salted cod are produced and sold according to well-known specifications and can be characterised as commodities that are sold in spot markets where price-based competition prevail (Asche, Menezes & Dias, 2007). The Norwegian cod industry faces many challenges not in the least the seasonal variability of the quality of cod, and its availability (Hermansen & Eide, 2013). This in turn creates large variations in the price of cod and cod products. The Norwegian cod quota had increased by 142% to 472 thousand tons from 2008 to 2013. In the same period the average price (in round weight) to fishers has been reduced by 110% to less than 8 NOK/kg (Norwegian Seafood Council, 2017). Fishing and processing large quantities of cod in a short time often lead to poor quality, which may affect the reputation of Norwegian cod negatively, a key dimension for competitive advantage (Dreyer et al., 2008).

CATCH (2014-2018) is a Northern Norway founded IDR project funded by the Research Council of Norway that has as main objective to "catch" the maximal sustainable value of wild Atlantic cod based on live storage. The project is founded on the premise that cod products based on live storage have the highest potential to optimize the value of at least some parts of the cod resource. By keeping cod alive after capture, the long-standing and substantial logistical challenges associated with variations in supply volumes and quality (Ottesen & Grønhaug, 2003) can be overcome (Olsen et al., 2013b; Dreyer et al., 2008). This opens up completely new possibilities for market-oriented and sustainable value chains for wild cod (Hansen et al., 2007).

The repeated lack of success in both research and business initiatives of live storage of cod in the past 20 years has been attributed to a non-systemic overview of technological bottlenecks related to fish capture and handling. Technological bottlenecks within the FAIB is serious due to that emerging industries such as that of capture-based cod aquaculture in Norway face complex challenges in terms of acquisition of expert knowledge and value-chain integration of processes (Vanpoucke, et al., 2017; Porter, 1998). Thus, to exploit the substantial advantages of this market-oriented concept, a substantial and interdisciplinary research approach is required where natural and social sciences are closely integrated. The focus on differentiated products of high quality is also highly relevant in light of the increased competition from cheap substitutes to cod such as pangasius and double frozen cod products filleted in low cost countries such as China and marketed as chilled/fresh fillets in European supermarkets (Altintzoglou et al., 2012; Asche et al., 2009). In order to optimize research relevance and practical application, CATCH is inspired by actual value chains with highly motivated and committed industry partner (Ottesen et al., 2002).

CATCH: AN INTEGRAL CULTURE AS 'SYSTEMS' APPROACH TO PROJECT MANAGEMENT

Table 1 lists the research institutions and industry partners in CATCH. There was a total of 15 institutional and enterprise collaborative partners in CATCH, of which 8 were from the Norwegian FAIB industry. Each institution/industry partner had a core team of individuals dedicated to the project, depending on knowledge expertise. Although with a specific focus on cod, the brief profiles of the stakeholders still illustrate the breadth of scope reflected in the coverage of its value chain and multiple stakeholder cultures (value systems and ways of working across the value chain).

Table 1. Institutional and industry collaborators in CATCH

	Industry partners	
No.	Name	Core business
1	Ballstadøy AS	Shipping vessel
2	Coop Norge SA	Cooperative supply chain in (mainly) food trade
3	Halvors Tradisjonsfisk AS	North Norwegian coastal fishing fleet and supplier of fish
4	Multivac AS	Packaging equipment supplier
5	Myre Havbruk AS	Capture-based aquaculture enterprise in Northern Norway
6	Nergård AS	Integrated fishery group founded in Northern Norway
7	Nic Haug AS	Producer, white fish products
8	Tommen Gram AS	Food packaging
	Research/University partners	
	Name	Country
9	Aarhus School of Business	Denmark
10	Duke University	USA
11	Handelshøyskolen (Business School), The Arctic University of Norway (UiT)	Norway
12	Norges fiskerihøgskole (College of Fishery Science), The Arctic University of Norway (UiT)	Norway
13	*The Norwegian Institute* of Food, Fisheries and Aquaculture *Research (NOFIMA)*	Norway
14	University of Stavanger	Norway
15	Zurich University of Applied Sciences	Switzerland

The following section will outline the various fields of research for CATCH, where the subject / themes of research are divided into 8 work pages (WP). These work pages are labelled WP1 to WP8. The WPs are situated in an integral systems model for IDR project in Figure 2. These WPs were led by individuals from diverse disciplinary backgrounds that in turn, constituted the myriad disciplinary cultures in this project.

Fields of research for CATCH

WP1 Process technology: Harvesting methods in relation to fish physiology

This WP was led by Nofima researchers Kjell Midling, who has an academic background in biology and Sjurdur Joensen, who has an academic background in economics and processing technologies. Apart from the biological rhythms of cod physiology through the seasons that affect muscle properties, the quality of wild-caught cod is affected not in the least by the fishing gear and on-board handling methods during harvest (Esaiassen, Akse & Joensen, 2013; Joensen et al., 2005, 2004). When cod is kept alive after catch, inappropriate on-board handling, poor bleeding techniques (Olsen et al., 2013b) and pre-slaughter stress (Olsen et al., 2008) can be reduced or eliminated. Live stored cod will have natural variations in muscle properties throughout the year due to fish size, seasonal feeding patterns

and spawning activity. Such variations in muscle properties have consequences for how the raw material will perform during processing, contributing towards the quality of the final products. As such the overall objectives for WP1 is to optimize the slaughter process towards the more humane treatment of cod.

WP2 Process technology: Storage methods

This WP was led by Nofima researcher Leif Akse who has an academic background of processing technologies. Live storage of cod makes pre-rigor processing possible. This has advantages such as less fillet gaping and improved texture (Hultmann et al., 2016; Olsen, 2013b; Hultmann et al., 2012). Pre-rigor filleting also improves logistics and reduces cost at the processing plant as there is no need for raw material storage in wait of processing. Another pre-rigor challenge of cod addressed in WP2 is the substantial shrinkage of fillets during storage, giving fillets an unusual, thicker shape. Inspired by research on salmon fileting (Skjervold et al., 2001). The overall objectives of WP2 is to optimize quality and yield of chilled fillet portions, fresh as well as thawed.

WP3 Bio-chemistry and fish physiology

This WP was led by Nofima researcher Anlaug Ådland Hansen who has a doctoral degree in bio-chemistry, particularly in food packaging. Due to the freshness of the raw material and low microbial activity, pre-rigor processed fillets are an optimal starting point for further extension of product shelf life for chilled ready-to-use consumer products (fresh/thawed). Raw fish products are open for contamination by a diverse mixture of bacteria during harvesting and processing, but little is known about the total microbial flora (Cambon-Bonavita et al., 2001) and how it may affect product quality and shelf life. It is also reported that bacteria can be inactivated by freezing (Bøknæes et al., 2000). Modified atmosphere packaging (MAP) by use of carbon dioxide (CO_2) has been shown to inhibit bacterial growth and negatively associated odour attributes during chilled storage (Rotabakk, Sivertsvik & Birkeland, 2009; Hansen et al., 2007, 2009). As such, WP3 will conduct experiments at both laboratory and commercial scale with industry partners towards a deeper understanding of the cod live storage processes.

WP4 Marketing, product segmentation

This WP was led by marine economist Professor Frank Asche from the University of Stavanger, Norway. Seafood assortment and pricing at supermarkets reveals a lot about product competition and differentiation within a given food category. For example, detailed information about product/attribute assortment can reveal who the competitors are and what product attributes they emphasize in attempts to differentiate their offerings (Sogn-Grunvåg &Young, 2013). It can also reveal whether unique attributes and price premiums for individual product attributes exist (Roheim, Gardiner & Asche, 2007). The overall objective for WP5 is to deeper understand the perceived quality, satisfaction, willingness to pay, and buying behaviour for different product forms, packaging formats/technologies and product information (Tonkin et al., 2015; Grunert, 2002).

WP5 Marketing, consumer behaviour

This WP was led by consumer behaviour Professor Svein Ottar Olsen from the University of Tromsø, Norway. In the area of marketing and consumer studies, the influence of extrinsic information on consumer choices such as brand name, price, country-of-origin, packaging, labelling, ethical and health information has been a research area for years (Wardy et al., 2018; Tudoran, Olsen & Dopico, 2009; Maute & Forrester, 1991). In recent years, multi-sensory marketing (Wiedmann et al., 2013; Hultén, 2011) has become a growing research area in consumer behaviour. Product experiences involve several sensory cues or types of information (Haase & Wiedmann, 2018; Hartman, 2016; Selnes & Howell, 1999). Knowledge acquired in WP5 will contribute to current literature on how intrinsic and extrinsic attributes in food affect product evaluation (Wardy et al., 2017; Shifferstein, 2010; Oliver, 2009).

WP6 Global value chain

This WP was led by researcher Bent Dreyer at Nofima, who has an academic background of industrial economics. Live storage has to compete with the traditional value chains based on different capture technologies such as trawl, gillnets, long-line and Danish seine (Ottesen & Grønhaug, 2003). In order to succeed, the live storage concept must perform better than these value chains in terms of ecological, economic and social sustainability (Eggert & Tveterås, 2013). The overall objective for WP6 was to map the sustainability – and areas for improvement – for live storage of cod. It will also explore how public management may hinder/stimulate the live storage concept and how this may influence the three dimensions of sustainability.

WP7 Learning impact: Society-Science / University-Industry interface

This WP was led by researcher Geir Sogn-Grundvåg from Nofima, who has an academic background in marine economics and management. He is also the overall project leader for CATCH. An IDR project inherently interfaces between society and science, research and applied practices. The key responsibilities of WP7 are to "pull together" implications of the findings from the different WPs by developing strategic recommendations for the seafood industry and to facilitate interdisciplinary learning both (Bruce et al., 2004) within the CATCH consortium and international researchers/ institutions working with live storage of fish. Recommendations of how to overcome learning barriers in interdisciplinary research will be made. A crucial task in this respect is to encourage and stimulate participating researchers to value research diversity and to be sensitive to the dynamics when different research cultures and disciplines interact (Wall-Bassett, 2018; Reich & Reich, 2006). This will be given explicit attention at workshops and joint project meetings. Other means to overcome communication barriers include frequent face-to-face meetings and video-conferences (Lync), particularly at the start of the project and at certain milestones when decisions need to be made (Lyall & Meagher, 2007; Grønhaug & Haukedal, 1997). The route from research results to practical application is a rather cumbersome one. This is particularly so for social sciences which usually contribute with conceptual knowledge that can be more difficult to adopt and use by the industry than the instrumental knowledge typically emerging from natural sciences (Grønhaug & Haukedal, 1997).

WP8 Knowledge dissemination and communication of results

This WP was led by research and communications director Morgan Lillegård from Nofima, who has extensive background in communications, journalism and media marketing. WP8 is devoted to disseminating the results from CATCH to relevant users of the results. This includes targeting academic and industry seminars, attending both academic conferences as well as trade fairs. A key premise will be that communication is directed at targeted user groups with appropriate media channels.

FINDINGS AND DISCUSSION

CATCH is an IDR project that is situated in the broader field of FAIB and sustainability science in an era of Industry 4.0. It addresses challenges at the interface of advancing technologies, society and science, in close collaboration with the Norwegian fisheries and aquaculture industry sector. The research findings are intended to create change within industry practices, and in a longer-term perspective, to create a behavioural change within the consumer market. Methodologically, its main method of analysis is empiricism and systems theory of science, reflected in the UR and LR quadrants. The common cultural denominator of the value system in this IDR project could be said to be the process of scientific inquiry. In this case, it is an object in bio-chemistry, fish physiology or process technologies, with the dominant perspectives used reflected in the pronouns *It* (*singular objective)* and *Its (plural interobjective).* Figure 2 illustrates the various fields of research for CATCH and the knowledge zones utilized in order to address the FAIB challenges outlined in the project.

[insert Figure 2 about here]

Figure 2. The work packages in CATCH and their knowledge zone contextualisation from an integral systems perspective (authors' own)

Returning to the research questions and in answer to RQ1, Figure 2 illustrates how a culture as system perspective can be used to unfold the complementary knowledge zones that characterises an IDR project. To have WPs 1 to 8 in address to the various units of analysis, from smaller to larger units of analysis is part of the inherent holonic, multi-perspective, multicultural and multi-layered structure of an IDR project.

Most projects involve normative forms of communication between collaborators. Face-to-face meetings, virtual meetings, field studies, seminar exchanges and project phrase follow-ups between the collaborators are some examples of the types of meetings and activities that have taken place during the research processes of CATCH. Some qualitative interviews conducted for CATCH are reflected in this section. The qualitative interviews, a series of 17 videos, can be found on the CATCH project webpage (CATCH, 2018).

A crucial project management strategy for CATCH, and in answer to RQ2, is that CATCH had all collaborators onboard the project from the very beginning. This highlights the aspect of the need to communicate ideas across cultures. A post-cultural dimensions construct of culture theory necessarily incorporates an investigation into the capacity and ability for the different academic and corporate culture groups to communicate in a multilingual landscape. One way to mitigate miscommunication is to ensure that all collaborators are onboard the project as early as possible, if not from the very beginning. The commitment of all collaborators in CATCH is reflected in the UL quadrant, where individual and organization commitment is highlighted. While committing to an IDR involves a sense of inner conviction, this inner conviction and philosophy is further materialized in the form of written contracts between all collaborators so that each participant and participating institution/enterprise knows explicitly (in writing), what is expected of them in terms of degree of involvement in CATCH, and delivery of results for CATCH. While some scholars have argued that the very process of committing to certain deliverables from the beginning would inhibit the very creative processes of an IDR (Holmes et al., 2018), concretisation of a vision through writing could also be argued as a means of working towards actualisation.

A second observation for CATCH that answers RQs 1 and 2 is that the work within CATCH work packages themselves are cross-disciplinary, tapping into more than one type of knowledge and academic/industry culture zone:

CATCH is a good example of how research institutes can work together with industry. - Elisabeth Aspaker (Fiskeriminister, Norway)

WP7 on the learning impact of CATCH at the interface between society and science, university and industry can be placed in knowledge zones in the LL and LR quadrants. Because learning takes place at the boundaries of where individuals meet and exchange views, those boundaries can be found at group level as well as system level where systems are inherently interactive. Other work packages that can span different types of knowledge zones include WP4 where consumer behaviour (*We/They*, plural intersubjective perspectives) is studied in relation to product segmentation (*It*, singular objective perspective).

Finally, in answer to RQ3, the social and pedagogical impact of IDR is not often times easy to measure. Still, for collaborators of CATCH, the value of participating in an IDR is to gain insight into a field that on normative basis, one has little or no access to. Participating in an IDR project with a heterogenous cultural landscape seems to deliver positive social learning experiences, and industry practice influences:

The Norwegian Fishermen's Sales Organization needs to know what is happening in the industry. Capture-based aquaculture is a fairly new industry and much works needs to be done there. - Charles A. As (Advisor Råfisklaget Norge, The Norwegian Fishermen's Sales Organization)

For me what CATCH has done is to help me understand the Norwegian market for fresh cod and how people would like to buy and consume cod fillets. The results from CATCH show how we can deliver high quality cod fillets, rendering new market knowledge, and knowledge from micro-biology to live storage of cod up to slaughter techniques and packaging of fresh cod. - Morten Heide (Researcher, Nofima)

While some influences or impacts of CATCH as an IDR remain unmeasurable, reflected at best in qualitative interviews with individual collaborators of the project, an integral (culture) systems perspective of an IDR project such as CATCH helps collaborators and project managers map complementary knowledge zones. Figure 2 for example, can help identify knowledge gaps within the IDR project even prior to project commencement. It can also help steer the project using a systems overview of the project progress.

CONCLUSION

This chapter conveys the processes and results of a study that investigates and uncovers the management strategies of the project CATCH through a culture theories perspective. It illustrates a more nuanced approached to the analysis and framing of cultural heterogeneity in the context of an IDR project in a context of Industry 4.0. The contribution of this study has been twofold, including (i) consolidating a culture as system theory by using an empirical example of and IDR project, CATCH, which is a project timely situated in a field that is inherently interdisciplinary in nature, with close industry collaboration. It (ii) develop deeper insights into the management processes and strategy of an IDR project across differing academic disciplines and industry backgrounds. The project CATCH draws upon the expertise knowledge of a total of 15 affiliated partners, both from industry and university sectors, in working towards broadening our understanding of preserving, if not enhancing cod products based on live capture and storage before slaughter.

The critique of the integral systems view to conducting IDR projects are similar in foundation to that of the study of natural phenomena. Due to that it is not possible for any one human mind, even a specified group of expert individuals, to understand all phenomena in its entirety, the IDR management process four-quadrant model reflected in Figures 1 and 2 are conceptual models. In that sense, they reflect an approximate knowledge and understanding of reality. Approximations in knowledge when applied to other working contexts can prove useful in the means in which the model can be adapted and render new insights into different IDR working contexts. Not explored in this chapter are the possible cross-cultural or intercultural communication strategies used in CATCH, an insight of which could prove useful in strengthening a systems perspective to the management of culture in a multilingual / multicultural IDR project landscape.

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KEY TERMS AND DEFINITIONS

CATCH: CATCH is a 4-year (2014-2018) interdisciplinary research project set within the context of the fisheries and aquaculture research and business sector in Norway. CATCH, an applied sciences industry-university collaboration towards higher quality yield of capture-based aquaculture for cod.

Cultural dimensions construct: The cultural dimensions construct of culture theory is often reflected in applications of Hofstede's national culture dimensions (Peterson & Hofstede, 2003; Smith, Dugan, & Trompenaars, 1996).

Fish: The term 'fish' is used in accordance to the Food and Agriculture Organization of the United Nations (FAO 2018) definition referring to fish, crustaceans, mollusks and other aquatic

animals. The term excludes aquatic mammals, reptiles, seaweeds and other aquatic plants. The term ‘fish’ is also used in synonymous exchange with the term ‘seafood’.

Holon: Used in accordance to Koestler (1967), referring to an entity that is simultaneously a whole and a part.

Interdisciplinary Research Project (IDR): For the purposes of this chapter, the term IDR is used to refer to both academic interdisciplinary research as well as industry-university research collaboration.

Systems theory: Systems theory is an interdisciplinary theory about the nature of complex systems in nature, society, and science. It is a framework by which one can use to study, investigate and describe any group of objects that work in collaboration towards a common purpose/goal. Systems theory can be applied to both organic as well as inorganic (informational artifact for example) organizations. The science of systems began with Ludvig von Bertalanffy’s 1968 General System Theory (GST).

Integral theory: Integral theory can be seen as a form of systems theory. Its ideation founder is Ken Wilber, an American transpersonal psychologist, who studied and formulated a framework for a “theory of everything”, the living “totality of matter, body, mind, soul and spirit”. Integral theory draws from a number of different scientific paradigms on human-cognitive development, putting them together in a single framework whose applications are useful due to its breadth of scope and capacity to accommodate a multitude of contexts.