Chapter 7
How to Start Strong: Different Approaches for Crafting Project Briefs with Corporate Sponsors for Global Innovation and STEM-Based Team Projects

Tamara Carleton and Falk Uebernickel

7.1 Introduction

How you start matters—in a new job, a love relationship, and even a team project. Both professional teams and student teams have told us numerous times that a strong start sets the tone for the project execution, builds team momentum and confidence, and increases the likelihood of successful project outcomes. In contrast, starting off badly often adds unnecessary obstacles, which delay and demotivate teams who must then clarify project scope, regain team trust, and steer a project back on track.

For many student team projects, the project brief serves as the primary starting point for a project, which gives this document extra importance in setting a project and the team up for success. What makes a good project brief? How are project briefs typically framed for students, and are there better ways to craft a project brief with a corporate sponsor that can be then presented to student teams to own? We consider these questions based on an international data set of project briefs drawn from project-based courses at multiple universities across a decade, aiming to distill

Teaching tools are another important element for putting Creative Pragmatics in action, so book editor Tamara partnered with her Swiss-German colleague Falk in this chapter to consider the classic tool of a project brief in the context of project-based learning. As a starting point, the prompt in a project brief serves as a significant framing device in the student learning process. (Editors)

T. Carleton (✉)
Department of Mechanical Engineering, Blekinge Institute of Technology, Karlskrona, Sweden
e-mail: tamara.carleton@bth.se

F. Uebernickel
Hasso Plattner Institute, Potsdam, Germany

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our analysis into practical recommendations for corporate sponsors and teaching teams. While our recommendations primarily relate to project-based courses taught in a university setting, others using project briefs with student or professional teams may find these recommendations useful to adapt to their unique situation.

Moreover, this study topic connects deeply to taking a Creative Pragmatics approach in STEM (science, technology, education, and mathematics) education, which is the core theme in this book. A project brief is an essential tool that frames a team's shared learning experience, setting the tone and scope of what is expected and possible from the project start. By better understanding what defines an effective project brief, STEM educators can offer students more creative and pragmatic agency, empowering students to shape their own learning and growth.

7.2 Background

This study builds on prior research about project-based learning and project briefs, focusing primarily on studies about Stanford's ME310 course and the SUGAR Network, which conduct different yet complementary project courses, which we describe below.

7.2.1 About Project-Based Learning (PBL)

Project-based learning (PBL) is a student-centric pedagogy where students work on a time-bounded project, often in teams, based on real-world problems. The premise is that students learn best when they are actively engaged in the learning process, often directing their own learning through ongoing inquiry and reflection, and when they can apply what they have learned to real-world situations. Various studies (e.g., Kokotsaki et al., 2016; Duschl et al., 2016; Laur, 2017) have shown that when implemented well, PBL can increase student engagement, improve content retention, and produce better outcomes and learning competencies than traditional learning formats.

7.2.2 The Role of Project Briefs in PBL

In project work, a project brief is a well-known document that outlines the key elements expected for project execution, typically describing the goals, objectives, scope, timeline, various roles and responsibilities, and deliverables for that project. In industry, project briefs are used regularly by project managers, freelancers, designers, and others to set up and communicate project requirements with colleagues, vendors, and stakeholders.

A project brief is used similarly in PBL courses to guide students through a project and ensure that they understand and meet the objectives. In corporate-sponsored projects, a project brief is generally drafted first by a corporate sponsor, often with input from the corresponding professor or instructor. Sometimes the brief is defined in collaboration with students; from our personal experience though, we have rarely seen this joint activity. A project brief may also be used to assess student performance. By comparing the final deliverable to the project brief, course faculty and instructors can evaluate whether students have met the project's objectives and assess their understanding of the subject matter.

Research specific to design education have examined the role of a project brief—also called a design brief—in terms of student engagement (Sadowska & Laffy, 2017) or as a digital learning tool (Demirbas and Timur Ogut (2020), among other functions. Kelley (2020) posits that key elements of the standard design brief are not well understood in STEM or design engineering education, plus a major void exists in primary and secondary education, often termed as K-12 levels in the United States. His view is that, at its essence, a design brief is a "basic description of a design problem" before listing problem constraints and criteria for students (ibid., pg. 9). Kelley has found five common elements in a design brief as follows: (a) a picture or graphic to set the context, (b) a short problem statement or scenario, (c) a list of identified constraints and criteria, (d) a list of prototyping materials, and (e) a final statement telling students how to begin the design process. The problem statement or design scenario is especially important because it provides students with a basic description of the problem they should address.

7.2.3 Stanford's ME310 Course and the SUGAR Network

At Stanford University, the ME310 engineering course has been taught repeatedly since 1967, so it offers a long history as an award-winning PBL course (Carleton & Leifer, 2009; Carleton, 2019). The full course is approximately nine months long, or three consecutive academic quarters that are each 12 weeks. During the course, student teams work on one corporate-sponsored project the entire time, so that they may take a concept through testing to initial implementation. A student team starts with a project brief typically received in the late autumn term and presents a working prototype back to their sponsor by the following late spring. Teams have averaged 3–4 students in size, and each team works on a different sponsored project.

Student teams are guided by a mix of senior faculty, teaching assistants, and volunteer coaches on various assignments throughout the course. Not only do students learn from their experience within their respective projects, they also learn from observing and sharing feedback with classmates working on the other projects. Across the course history, several companies have returned as sponsors, though not necessarily the next academic year, so these sponsors have their own learning and evolution with the course.

In the mid-2000s, Stanford's ME310 faculty changed the course format by inviting new partners from academic institutions outside the United States—in places such as Australia, Brazil, China, India, Italy, Germany, Mexico, and Switzerland—to jointly support student projects. While some faculty at these institutions were based in engineering departments, others came from different academic areas, such as business and design. That year and in following years, Stanford student teams were partnered with student teams from other academic institutions, so that a corporate sponsor benefited from a larger and internationally mixed team of students. In practice for example, a team of three students from Stanford in the US worked with a team of four students from the University of St. Gallen in Switzerland on the same project sponsored by pharmaceuticals company Merck based in Germany.

Stanford's ME310 course has been often capped annually at 10 projects total, which limited participation from possible academic partners. The growing partner network became keen to engage more students at their home institutions and accommodate different financing needs from local sponsors, so these partners soon joined together on additional new projects. Faculty at these partner institutions adopted the ME310 curriculum in order to better synchronize student milestones and grading evaluations across all projects. These partnerships ultimately led to an informal consortium dubbed the SUGAR Network, which ran in parallel to Stanford ME310 events (Carleton, 2019; Uebernickel & Thong, 2022). The SUGAR Network gradually formalized and has added more academic partners that collaborate regularly with one another (Wiesche et al., 2018).

Various studies of ME310 and SUGAR courses across the decades have examined student learning outcomes (e.g., Berglund et al., 2007; Sjöman, 2014), plus demonstrated how the PBL format has prepared individuals for career success past the course (Sheppard et al., 2023). Notably, Juan Felipe Ruiz—who has firsthand knowledge from his experience participating at two SUGAR schools—examined 118 project briefs from Stanford's ME310 course in terms of their problem space and solution space (Ruiz, 2020). He posits that creating a good design brief is challenging due to the diversity of design processes, problems, and other variables involved, thus thwarting any attempt at standardization. He introduces a typology dependent on problem context, presented visually as a 2×2 matrix comparing problem space and solution space along axes from defined to undefined, which then could function as a "thinking/talking tool" with sponsors.

In addition to existing literature, both authors bring personal knowledge of these project courses. One author (Carleton) has documented the history of Stanford's ME310 course and preserved its final report documentation in Stanford Engineering library archives, plus oversaw SUGAR Network operations for two years. The other author (Uebernickel) served as an early academic partner with Stanford ME310 and then as a SUGAR Network cofounder and has been a SUGAR co-chair since 2016. Together, we draw on a deep knowledge base shared across Stanford and SUGAR, including a decade-long research publication series, jointly spearheaded by Stanford University and Hasso Plattner Institute.

While the ME310 and SUGAR pedagogy share multiple tools that structure student project work, we focus on one tool in this study that is directly relevant to project briefs. The "how might we" tool—often abbreviated as HMW—starts an

open-ended inquiry with these three words. As many core SUGAR partners joined during the rise of the design thinking movement from the late 2000s through the mid-2010s, they added several design thinking tools to their curricula, especially the HMW tool. (As an aside, while often attributed to design firm IDEO, the HMW technique actually originates with creativity expert Sid Parnes from his 1967 book *Creative Behavior Guidebook*.) The value of using HMW in project briefs is that students start a project by exploring possible options more freely (the "how" part in HMW), defer judgment on the final solution (signified by the word "might"), and use more collaborative language ("we").

7.3 Research Approach

As data from Ruiz was inaccessible, our study examines a complementary data set of 68 project briefs from Stanford's ME310 and SUGAR Network courses from the years 2011 through 2022 in light of two research questions.

7.3.1 Two Research Questions

Our first research question was: how prevalent is the "how might we" (HMW) phrase as a structural prompt and what other types of prompts were most used by sponsors to frame a project brief? We expected that most sponsors relied on HMW given its recent popularity in the PBL and engineering design communities. To assess HMW and other prompts, we used textual analysis based on absence/presence in the project briefing documents.

Our second research question was: how do project briefs compare in terms of their future horizon? In other words, how far out in the future did sponsors aim for project results when challenging students? This question was analyzed using the Four Horizons model, which originates from innovation work by Carleton and Cockayne (2023). The Four Horizons model lays out a spectrum of four horizons mapped to innovation stages, shown visually in Fig. 7.1:

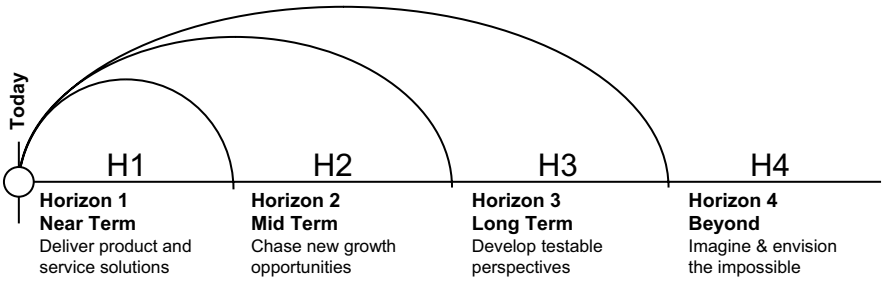

Fig. 7.1 Four Horizons model. (Carleton & Cockayne, 2023)

- Horizon 1 (H1) corresponds to near-term outcomes, such as service improvement or a product extension. Knowledge for a possible solution is readily available and known, though its implementation may or may not be easy.
- Horizon 2 (H2) corresponds to mid-term outcomes, such as different market segments or entirely new product lines.
- Horizon 3 (H3) corresponds to long-term outcomes, such as lab experiments or innovation pilots that require new knowledge to be invented or discovered, thus taking longer to come to fruition.
- Horizon 4 (H4) corresponds to more speculative outcomes, such as far-out visions and what-if ideas, that offer future perspective yet require substantially more understanding before becoming H3 experiments.

By overlaying these horizons on an ambiguity curve, H4 has the highest level of ambiguity going down to H1 that has the lowest level of ambiguity. We analyzed the wording of each project brief, judging its most likely horizon level for the outcomes desired based on existing available knowledge—in engineering, technology, medical science, and other relevant fields—at the time that the brief was introduced to students. (As a related point, Cockayne taught the Four Horizons model as a guest lecturer to Stanford's ME310 teams in 2021, so some students are familiar with it, while others might know of this model through other channels.) While project briefs are intended to provoke more imaginative thinking in student teams, we expected to see project briefs cluster between Horizons 1 and 2. Our assumption was that sponsors desired rough concepts that could be readily adopted for internal implementation. In addition, we felt many sponsors faced internal pressures to show fast and visible value of a university sponsored project to senior management, so they would likely avoid long-term outcomes, focusing more on near-term results.

7.3.2 Combined Data Set

A subset of project briefs was randomly drawn from the ME310 course collections owned by Stanford Engineering library archives across the years of 2011 through 2022, all of which is publicly available. One challenge was that this Stanford collection primarily features final project documentation from student teams, which occasionally includes the original project brief from the course start. We then supplemented Stanford data by contacting academic partners in the SUGAR Network for their personal archival data of project briefs. Over half of SUGAR partners lacked easily accessible records or had not saved them beyond the immediate course year.

Available data of project briefs was collected digitally in various file formats (e.g., PDF, Word, PowerPoint). A total of 19 academic institutions are represented in the data set, ranging from 25 projects maximum to one project minimum per

Table 7.1 Academic institutions in the study listed by project frequency

Academic institution	Country	Total projects
Trinity College Dublin	Ireland	25
Stanford University	United States	23
Kyoto Institute of Technology	Japan	16
Pontificia Universidad Javeriana Cali	Colombia	11
University of São Paulo	Brazil	10
Blekinge Institute of Technology	Sweden	9
Karlsruhe Institute of Technology	Germany	6
Aalto University	Finland	5
Swinburne University of Technology	Australia	5
University of St. Gallen	Switzerland	4
University of Modena and Reggio Emilia	Italy	3
dschool Paris	France	2
Indian Institute of Technology Kanpur	India	2
Indian School of Design & Innovation (Mumbai)	India	2
Norwegian University of Science and Technology	Norway	2
Polytechnic University of Porto	Portugal	2
Linköping University	Sweden	1
National Autonomous University of Mexico	Mexico	1
University of Bologna	Italy	1
University of Science and Technology of China	China	1

institution with a general average of nearly seven projects. As student projects typically span two academic institutions, one institution may provide data on behalf of the partner institution. In addition, five sponsored projects lack a second academic partner. See Table 7.1 for the list of academic institutions, using their respective names in English, listed in terms of project involvement. Note that the project frequency in this study does not represent the institution's actual number of historical projects.

In the data set, project briefs ranged across a decade timespan between 2011 and 2022. See Table 7.2 for the total number of projects listed by academic year (AY), which start in the fall semester (trimester) for projects. The highest number of project briefs was from AY2018-19, occurring before the global COVID19 pandemic.

The corporate sponsors for the projects ranged across industries. The greatest representation came from the manufacturing industry, which sponsored 29% of briefs studied. The next tier of industry representation came from Technology at 16% and then Education, Food, and Retail split across 6–7%. See Table 7.3 for the industry breakdown of corporate sponsors; industries sharing the same distribution percentage are then listed alphabetically within that percentage bracket.

Table 7.2 Student projects listed by academic year in the study

Academic year	Total projects
2012–2013	1
2013–2014	4
2014–2015	4
2015–2016	8
2016–2017	8
2017–2018	8
2018–2019	14
2019–2020	5
2020–2021	5
2021–2022	7
2022–2023	4

Table 7.3 Industry representation by percentage across the project briefs

Industry	Corporate sponsor(s)	Sponsor distribution
Manufacturing	Volvo Construction Equipment, Toppan Printing, Yanmar	29%
Technology	Panasonic, Philips, SAP	16%
Education	Trinity College Dublin E3 Institute, Pontificia Universidad Javeriana Cali	7%
Food	Z-Tech / InBev	6%
Retail	Media-Saturn, Totto, Loblaw Co.	6%
Automotive	Daimler, Renault, Volkswagen	4%
Health	CPHI	4%
Services	OrangeWorks, Grupo Coomeva	4%
Transportation	ANA Airlines, SUMMIT	4%
Public Sector	Enable Ireland	3%
Construction	Spie Batignolles	1%
Defense	Saab	1%
Energy	Osaka Gas Chemicals	1%
Fashion	TriWool	1%
Infrastructure	Xylem	1%
Insurance	Grupo SURA	1%
Nonprofit	Plan International	1%
Pharmaceuticals	Takeda	1%
Telecommunications	SwissCom	1%

7.4 Results

Our analysis showed that corporate sponsors followed no set standard or consistent template across any project briefs, even from the same sponsor in different academic years. Overall, project briefs were kept concise, many starting with a short description about the sponsor's business and/or respective industry to provide initial

context to student teams. More than half (57%) of project briefs were described in fewer than 50 words, while the remaining briefs (43%) were longer, some up to several pages in length.

7.4.1 Uneven Inclusion of Common Brief Elements

Although Kelley (2020) identifies five common elements of a design brief as mentioned in our literature review, we found that none of these same elements were consistently used by either ME310 or SUGAR project sponsors. We discuss the average frequency of each element in order of Kelley's list, which to recap are: (a) a picture or graphic to set the context, (b) a short problem statement or scenario, (c) a list of identified constraints and criteria, (d) a list of prototyping materials, and (e) a final statement telling students how to begin the design process. In terms of visuals, slightly over three-quarters (76%) of the project briefs in our study featured no visual of any type—such as a photo, illustration, or diagram—which meant slightly under a quarter (24%) of briefs featured any visual as another way to visually show the opportunity or challenge. No project brief specified prototyping material requirements or instructions on how students should begin their design process. Moreover, a large percentage (82%) of briefs lacked any statistics or data points to help quantify the future opportunity in some way. The few briefs with statistics used them to help students understand the potential market size, forecast industry growth, or show the problem magnitude. A small percentage (9%) of briefs included definitions of some type, such as for a specialized industry term or emerging technology. Nearly a third (30%) of briefs highlighted examples to offer more ideas or variations related to the opportunity or challenge presented, such as describing additional obstacles, possible use cases, or alternative technology functions. Almost a quarter (22%) of briefs presented a direct link between the student challenge and the organizational vision or sponsor's business goals. See Table 7.4 for a summary of the common elements included (or not included) in the briefs.

Table 7.4 Summary of basic elements included in the project briefs

Project brief element	Included	Not included
Visual (diagram, photo, etc.)	24%	76%
Data points or statistics	18%	82%
Definitions	9%	91%
Examples	30%	70%
Direct link to sponsor's vision or organizational goals	22%	78%

7.4.2 Seven Types of Project Outcomes

We found that corporate sponsors described seven different types of project outcomes across the briefs. These outcome categories emerged from the data analysis and are loosely interpreted, as some briefs did not neatly fit into a single category. Process outcomes were the most frequently mentioned in 29% of the project briefs related to creating, reimagining, or improving business operations, product or solution delivery, production optimization, or other ways of doing things. System outcomes were the next most mentioned at 24%, and these outcomes generally relate more to solution modularity, fit with the user setting or environmental context, or infrastructure interdependency. See Table 7.5 for the seven types of outcomes sought by corporate sponsors that were initially identified in this study.

7.4.3 Prompt Wording

Nearly two-thirds (65%) of briefs overall used "how might we" phrasing to present the project opportunity or challenge to student teams. A variant of HMW used occasionally was "How can we…" Most sponsors of SUGAR projects relied on HMW to start their project prompts. In contrast, a much smaller percentage—just over a quarter (26%) of briefs—from Stanford's ME310 course used HMW language.

The remaining briefs (35%) in the study used other phrases to provoke possibility. One group of phrases deliberately started with words that evoked imagination, such as "We dream…", "What if...", or "Imagine that…" A second group of phrases addressed the team project as a challenge, using words such as "Your challenge is..."

Table 7.5 Seven types of project prompts used by corporate sponsors

Outcome type	Percentage of use	Prompt example
Process	29%	How might we affect the supply chain and at-home experience to eliminate food waste?
System	24%	What will the future changeable, reconfigurable living space entail and how will it fit the emerging nomadic lifestyles?
Product	17%	Make an innovative modular product or a system by utilizing modern technologies in order to solve current issues or improve productivity with aquaculture businesses.
Service	17%	Your team's challenge is to create a solution to maintain communications for 7 days of power outages.
Market	11%	How might we reach 1 billion customers by 2030?
Integration	3%	How will future robotic, on-demand vehicles gracefully and safely accommodate wheelchairs and similar devices?
Model	2%	What if the user could use the digital thread of material, formerly known as dirt, to repurpose it and mine it once again from urban landscape and thus save the bedrock?

or "The challenge is…" A third group of phrases was heavily directed and solution focused, using specific words such as "The project goal is…", "Help users to…", or "Study and create…".

7.4.4 *Prompts by Innovation Horizon*

We found that project briefs were largely split across mid- and long-term innovation horizons. In fact, slightly over a third (35%) of briefs focused on H2 outcomes. In contrast, a quarter (25%) of briefs aimed at more near-term outcomes at H1. A small percentage (6%) were identified as wildly open-ended H4 prompts. See Fig. 7.2 for the distribution of project briefs by innovation horizon.

We inferred how much new knowledge was needed and the level of ambiguity inherent in each project brief in order to determine where the brief fit along the horizon spectrum. More explanation within a brief did not necessarily reduce the amount of ambiguity for a student team if there were evident "known unknowns" or even "unknown unknowns" in the solution space. See Table 7.6 for some prompt examples by innovation horizon.

Some curious patterns emerge when considering project briefs by academic year. H1 prompts occurred in waves roughly every two academic years. Most H2 prompts occurred during the mid- and late 2010s, specifically the academic years between 2015–16 and 2018–19, and then drop unexpectedly after the COVID19 pandemic. H3 prompts ranged between 13% to 60% of briefs in a year for most academic years, excluding two years when no H3 prompts were identified. H4 prompts start after the 2016–17 academic year, averaging one H4 prompt roughly every two years. See Fig. 7.3 for a breakdown of briefs by innovation horizon and academic year.

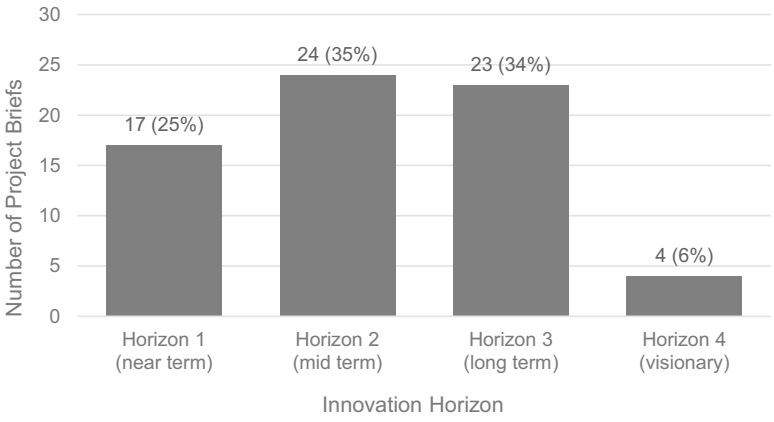

Fig. 7.2 Distribution of project prompts by innovation horizon

Table 7.6 Distribution of project briefs by innovation horizon

Horizon level	Percentage of use	Prompt example
Horizon 1	25%	How might we better integrate people with intellectual disabilities into society?
Horizon 2	35%	Which services for the elderly and for care helpers can we develop around the connected flooring for better aging (in the retirement house or at home)?
Horizon 3	34%	How might we sense and prevent mental disorders through networks of machines and humans?
Horizon 4	6%	How can nature inspire the next generation of water treatment, transport, or analysis technologies? What can we learn from the passive treatment processes of plants and soil? Can we replicate nature's low-energy fluid transportation methods? Where can we mimic nature's self-detection and protection mechanisms for adaptive architectures?

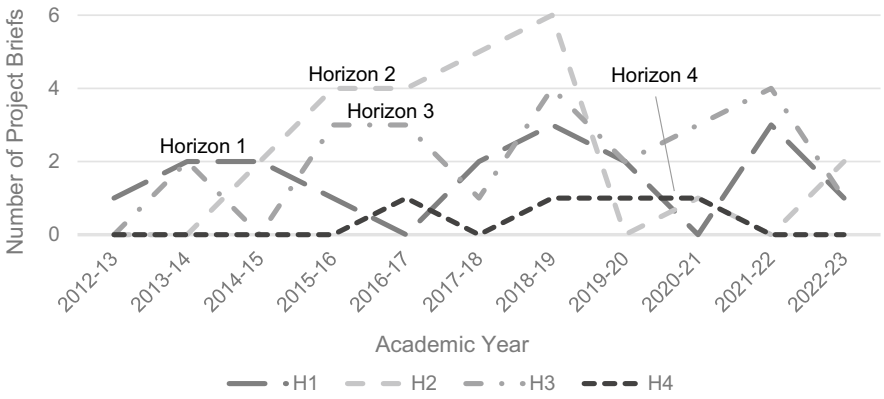

Fig. 7.3 Breakdown of project briefs by innovation horizon and academic year

7.5 Discussion

This study investigated what types of prompts were used by sponsors to frame a project brief project, notably how prevalent the HMW phrase was, and how project briefs compare in terms of their future horizon. Although all project briefs in this study featured a problem statement of sorts, the briefs ranged widely in which elements that they included, such as the use of a photo. Moreover, certain common elements that were identified in the literature review, such as design criteria, were consistently omitted by sponsors. A likely explanation is that the teaching teams for Stanford's ME310 and SUGAR projects addressed these other common elements—namely prototyping materials, deliverable constraints, and design criteria—in the various course assignments throughout an academic year, so sponsors did not need to include these specific elements in their project briefs.

7.5.1 Prevalence of "How Might We" Prompt

Across the briefs, the problem statement was presented typically more as a question or thought prompt than a declarative statement per se. Our first research question aimed to identify the prevalence of HMW phrasing in these prompts. Our initial assumption was correct in that most briefs relied on HMW, which we perceive as the influence of the design thinking movement when many core SUGAR academic partners become involved. Stanford's ME310 course has a much longer history and subsequently a larger archive of project briefs, so we expect its teaching team has tested more ways to guide corporate sponsors on how to effectively frame a project brief.

7.5.2 Range of Innovation Horizons Presented in the Project Briefs

Our second research question aimed to examine how project briefs compared in terms of their future horizon; however, our expectation was only partially correct. Most project briefs, instead of clustering on Horizons 1 and 2 as hypothesized, clustered across Horizons 2 and 3—and H4 prompts began largely from the COVID19 pandemic on. One possible explanation is that corporate sponsors view student teams as external foils for research and development activities within their organization. While managers at each sponsoring organization must maintain daily job tasks, perhaps they see youth outside their organization able to consider more outlandish and more open-ended questions that fall under Horizons 3 and 4, which can go beyond immediate business objectives. The COVID19 pandemic as a global crisis may also have spurred some corporate sponsors to realize the importance of considering bolder visions or farfetched outcomes. A related explanation is that the Stanford ME310 course has evolved its pedagogy, responding to changing market demands and other factors, thus expanding from narrow engineering problems in the 1970s to more open-ended student challenges through the 2000s and beyond (Carleton & Leifer, 2009).

7.5.3 Some Implications for PBL Courses and STEM Teaching

Project briefs are an important tool to start a project. Since many STEM projects and design challenges traditionally focus on existing user needs, our research findings raise key questions on how prepared faculty and student teams are to address more future-oriented PBL challenges with mid or far-term horizons. How much should faculty and coaches help students interpret and question a project brief at the project start? Moreover, how much should faculty push and induce broader thinking

in a student team, and do project briefs allow for more forward-looking thinking that extend beyond the innovation horizon as defined within its problem statement, even sponsor's comfort zone?

In a study of Stanford's ME310 projects, Lande (2012) posits that student teams are designing the future while designing *for* the future (emphasis added). He observed that student teams achieved stronger project outcomes when navigating regularly between multiple mindsets as represented by the disciplines of future/foresight, design, engineering, and production—versus operating too tightly within a singular mindset. As such, the project brief offers the first navigation point in a PBL environment, and it is our view that teaching teams can take up the responsibility to encourage student teams to widen their initial mindset for more inventive problem framing (scoping) and subsequent problem solving.

Moreover, we see a connection between the desired innovation horizon and the language used in a project brief. Faculty can help corporate sponsors consider the desired impact of their projects in terms of the innovation horizon and then match the initial prompt phrase accordingly. For example, if a project sponsor wants a more imaginative and ambitious proposal in the H4 realm, then he or she should consider more expansive prompt phrases, such as "We dream…". In contrast, a sponsor seeking more near-term outcomes suitable for H1 should use a more directed phrase in the project brief, such as "Help users to…". HMW could serve as the most flexible phrase targeting mid-term outcomes. Based on this thinking, we outline a two-question guide for faculty and corporate sponsors to use when developing project briefs as part of a PBL course or program. See Table 7.7.

Table 7.7 Two-question guide to PBL project brief development with corporate sponsors

Two-question planning guide for project briefs
1. Which innovation horizon best fits our desired outcome(s), and why?
(a) Horizon 1: Near term
(b) Horizon 2: Mid term
(c) Horizon 3: Far term
(d) Horizon 4: Visionary
2. Which phrase do we feel would provoke students most as a project prompt related to this innovation horizon?
(a) Help users to…
(b) Your challenge is…
(c) How might we…
(d) Imagine that…
(e) We dream…
(f) What if...

7.5.4 Study Limitations

Our study's findings are subject to several limitations. One limit is sample size. Our data set is a partial sample collected from a significantly larger data set—especially Stanford's ME310 course archives that go back to the 1970s—so we may have missed broader historical trends or a greater data range for a specific variable. Another data limitation was unavailable historical SUGAR project briefs, restricting a more comprehensive analysis. Enterprising scholars could remedy this issue for future studies by requesting that SUGAR faculty preserve these briefs. A third limit relates to the research method chosen. While textual analysis is a valuable research tool, a known limitation is researcher subjectivity. Regardless of our best intentions to be systematic, our data analysis is subject to personal biases. There may have been nuanced context when a particular brief text was produced that, if we had known, could have shaped the analysis differently.

7.5.5 Further Research

Project briefs for student teams and professional teams offer a rich area to investigate as this document is used repeatedly to guide new work across universities and industries. By building on our initial study, one future line of inquiry could examine which elements of a project brief are most critical and why. For example, do more visual project briefs—those showing photos, diagrams, and/or illustrations—help teams more effectively visualize the solution space or produce more imaginative results? Another line of inquiry could more thoroughly define and classify the range of project outcomes desired by corporate sponsors in PBL settings beyond our rough list. For example, how do better project outcomes, which are typically measured by course grades, correlate with certain outcome prompts in the project briefs? A third area of research could delve further into the Stanford ME310 archives. Our study provides one slice of project briefs across time, and it would be informative to collect and compare all ME310 briefs across the course history for noteworthy historical trends. A fourth area could examine the role and value of a project brief for problem formulation in PBL courses. These are just some possibilities to expand the research about the essential role of a project brief used in PBL courses, a Creative Pragmatics approach in STEM education, and beyond.

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Tamara Carleton PhD, global expert in radical innovation. Tamara is an award-winning professor, industry advisor, and author of radical innovation and strategic foresight. As a global professor of practice, Tamara is on the faculty of multiple business schools and technical universities around the world. Tamara holds the UNESCO Chair in Anticipatory Leadership for Innovative and Better Futures at Tecnológico de Monterrey in Mexico and was recognized as one of the Top 50 Women Leaders in Education of 2023 and 2024 by Women We Admire. As the founder and CEO of Innovation Leadership Group, Tamara helps leaders and teams to build innovation capacity and map bold futures. She has written several seminal books on innovation, including *Building Moonshots: 50+ Ways to Turn Radical Ideas into Reality* and the *Playbook for Strategic Foresight and Innovation*. She holds a doctorate in mechanical engineering from Stanford University.

Falk Uebernickel has been Head of d-school and Professional Development and Professor of Design Thinking and Innovation Research since April 2023 at the Hasso Plattner Institute (HPI) in Germany. Since 2019, his research has focused on nudging for sustainability and the psychology of digital transformation and innovation in companies. In addition to his position at HPI and a professorship at the School of Management at the University of St. Gallen in Switzerland, Falk is the author and editor of several books and has contributed to over 200 scientific publications. In his professional career, he has accompanied projects for a variety of companies with a focus on product and service development using design thinking and the establishment of digital innovation units.