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Human society is in continuous movement, physically or politically, willing or not. With digitalization and global warming, the pace of change has increased, and unpredictability has grown, challenging society and its institutions to evolve within a highly globalized and interactive environment, while facing even higher uncertainty in the future. Around the globe, all segments of human activity share the challenges of change, often organized as Turbulence, Uncertainty, Novelty and Ambiguity (TUNA) . For sectors that inherently depend on natural resources of biological origin, such as forestry, the stakes are even higher. Where rotation periods span decades and in some cases generations, uncertainty is even more relevant. The forest sector challenges go beyond what other sectors face, as the sector embodies the paradox of being regarded as an economic resource, and as an expected mitigator of climate change. Among forestry stakeholders, the academy has a unique condition as it hosts skilled professionals, experts of the many segments of the industry who, together, can think “in and out of the box”, to develop solutions for pressing problems, explore the unknown, and prepare the next generation of professionals for uncertain futures. In this project I tested a scenario planning tool for its potential to help higher education institutions integrate uncertainty in their strategic planning processes. The main objective was to study the relevance of the tool for higher education institutions and the feasibility of its use and implementation. The project consisted of three phases: 1) Identification of the main trends that influence higher education institutions today; 2) Two separate workshops, attended by faculty and graduate students, where scenarios were developed based on the Oxford Scenario Planning Approach deductive method, from Oxford

University. Both workshops sought to answer, “what is the future of forestry higher education institutions?” 3) Qualitative study based on an unstructured interview held with each individual participant. The trends were used as a resource for the workshops and the scenarios developed were assessed for completeness and comprehension of the outcomes by participants. The results for the thesis were collected from the interviews and analyzed according to a qualitative study. The main conclusions were: 1) Scenarios are relevant for forestry higher education institutions and feasible to be used. 2) There are significant challenges to adoption and implementation of scenarios; 3) To prepare the new generation of professionals with premises of scenarios is the most promising path to sensitize the forest sector to the TUNA forces; 4) A conclusion related to secondary goals of the project is that there is a huge opportunity for higher education institutions to become leaders in a knowledge based economy but these institutions need to overcome internal obstacles.

By presenting the concepts of TUNA forces and applying the scenario tool I hope to have contributed to these organizations to be best prepared for the challenges and opportunities in education and technology development in the future.

Scenario Planning, a New Planning Tool for the U.S. Pacific Northwest Forest Academy

by
Rodrigo Salles e Portugal

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I understand that my thesis will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my thesis to any reader upon request.

Rodrigo Salles e Portugal, Author

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1. Introduction

Human society is in continuous movement, physically and politically, willing or not. There are periods, though, when intense change takes place due to dramatic conflicts, disruptive technologies, political shifts or a combination of the above (Rockström, 2009, Pahl-Wostl, et al., 2013). As humanity strides through the present changes, new forces are calling upon society to take responsibility for the future of coming generations and of the planet itself. For instance, with digitalization and global warming, the pace of change has increased, and unpredictability has grown, challenging society and its institutions to evolve within a highly globalized and interactive environment, while facing even higher future uncertainty (The Global Risks Report, 2016, Ramirez & Wilkinson, 2016). Around the globe, all sorts of human institutions and organizations share the challenge of change. For sectors that inherently depend on natural resources of biological origin, such as agriculture and forestry, the stakes are even higher. Particularly for the forest sector, where rotation periods span decades and in some cases generations, uncertainty is even more relevant (Hoogstra-Klein, et al., 2016, de Bruin, et al., 2017). The forest sector is not only subject to the current challenges other sectors face, but also social expectations, regarding a natural resource to be utilized, and as a perceived mitigator of climate change (Maness, 2009). In these extraordinary times, it falls to the Academy to think "in and out of the box", to develop solutions for pressing problems, explore the unknown, and host its most relevant responsibility, preparing the next generation of professionals. Among the many stakeholders of the forest sector, the Academy holds a unique role to prepare the industry for the future, while potentially also helping to shape that future. Without immediate demands such as harvest schedules, and commercial deadlines, the academy hosts highly skilled professionals, experts of the many segments of the industry. This combination provides the resources to work as "think tank" for the forest sector.

Forest industry activity has been subject to change due to natural events, policies, economic turbulence and societal values throughout its history (Rich, 1986, USDA, 2012, Goergen, et al., 2013), but the new challenges arising in the last two decades increasingly challenge predictive approaches to future planning. With this realization, in the early years of this century, European scholars and practitioners intensified the search for new ways to improve the study of future uncertainty in the forest sector (Hoogstra-Klein, et al., 2016). As an example, in 2011, through the Integral project (Future-oriented Integrated Management of European Forest Landscapes) a scenario/backcasting approach was applied within 10 different countries, during a four-year study period. A total of 80 different scenarios were developed. Key to the success of the project was the participation of different stakeholders of the activity, including government agencies, industry, landowners and academic experts (Sandström, et al.,

2016, Wodschow, et al., 2016, Hengeveld, et al., 2017). A comprehensive search of the literature revealed no other similar project in the US.

In many ways, the context of the US with its continental dimension, variety of climates and individual State regulations, is comparable to that of the Europe Union (EU), with its different climates and legislation per country. It is also fair to say that the country's industry faces similar challenges related to global warming, digital technology, global markets and alternative products. However reviewing scientific papers and specialized literature, starting from the 70's, there's no evidence that no organized effort has been made by the forest sector, to address uncertainty in future studies with exploratory scenarios approaches. To fully write out the issues presented, an organized nationwide study led by either the government (e.g., through USDA), the industry or from experts in the academy is needed. In the absence of this comprehensive action, the present proposal intends to contribute to the bigger picture by applying scenario planning concepts to one forest industry stakeholder, the academy, in the Pacific Northwest. The project was developed in the College of Forestry at Oregon State University. It seeks to test the efficacy of incorporating uncertainty in the strategic thinking process, through the development of plausible scenarios focused on the future of higher education in the forest sector and potentially to develop paths and strategies necessary to achieve a desired future scenario. To achieve this, first, through a comprehensive literature review, the study seeks to understand the main trends identified by different institutions related to the sector. Second, an alternative exploratory scenarios exercise will be developed, based on the trends identified.

1.1. Objectives

The primary objective of this work is to evaluate the potential use of scenario planning, as a tool for studies of the future in the United States PNW forest sector academy;

Secondary study objectives include the following:

1. Identify key trends for the higher education system;
2. Present a new approach for scholars to envision potential futures and obtain suggestions for how to adapt the tool to the academia.
3. Develop plausible contrasting scenarios of the future for the question: What will be the role of forestry higher education institutions (HEI's) in the future?

2. Background

2.1. A Global context

Cultural and geographic change is nothing new to humanity. Along its history, significant changes took place including the cognitive, the agriculture and the scientific revolutions (Harari, Y. N. 2014). In the last three to four decades, a series of global events have been seemingly pushing change at a different rate. Disruptive technologies such as the internet and an empowered society at an incomparable level are giving social values an importance never seen in any terms in human history. The easy accessibility and interactivity is an ongoing force in society reshaping its values and demands. The implications of the "Fourth Industrial Revolution" remain far from fully understood. While presenting new opportunities for different actors and previously unimagined solutions to be explored, there are also risks such as changing employment patterns and cyber dependence. At the same time, climate change is already perceived as a reality in the physical, social and political realms bringing more uncertainty into the future in an environment where ruling systems such as capitalism and democracy are being challenged. Once stable, societies are becoming increasingly fragmented in many regions of the world, with a global economy that still has to adapt to these factors (The Global Risks Report, 2016).

In an era where "connectivity is the key driver" of value creation and vulnerability, the environment is wider, faster shifting and less predictable, there is a growing expectation that more disruptions are likely to come. Under these conditions, traditional planning approaches, strongly based on predictability, seemingly will not be able to cope with unpredictability. This demands a different approach to planning for an uncertain future (Ramirez & Wilkinson, 2016).

Preparing for the future is crucial for any economic sector to have success in its endeavors. As Shearer (2005, p.67) stated, "the ultimate success of decisions made today rests on the situation tomorrow". The truth of the statement is its ultimate obstacle. The future is unknowable, potentially turbulent, increasingly ambiguous, with change coming at a faster pace, filled with novelty, rendering it unpredictable (Weber, 2000, Ramirez & Wilkinson, 2016, Hoogstra-Klein, et al., 2016). From a goal to organize the business, into predicting the future, strategic planning evolved from a forecasting tool, in the first half of 20th century, to more recently, integrate strategic thinking to the planning process (Heracleous,1998, Hansen & Juslin, 2018). To address uncertainty, new tools have been developed or evolved such as, corporate foresight, scenario planning and back-casting, becoming increasingly adopted in many different economic segments (Ruff, 2015, Hoogstra-Klein, et al., 2016, Ramirez & Wilkinson, 2016, de Bruin, et al., 2017).

While the low-cost strategy has been successful enough in the past, since the 90's it has been increasingly challenged by a collection of "global events" such as: the digital revolution; climate change;

globalization and ultimately, change in social values, locally and globally (The Global Risks Report, 2016, Shab, 2016). As new challenges rise, and values change, complexity grows along the supply chain, including processes, products, advertisements and related regulation (Bettinger, et al., 2016). Combined with fast and interactive access to information, the pace and magnitude of change has significantly increased (Chermack, 2011; The Global Risks Report, 2016, Shab, 2016). In a "business as usual" environment, traditional strategy approaches, based on past history and a stable future are acceptable. However, today these techniques are insufficient and must develop further in face of potential turbulent and uncertain scenarios ahead (Ramirez & Wilkinson, 2016).

Strategy within the business realm evolved from an annual forecasting tool in the 1950's into longer term planning in the 1960's as demand increased and complexity grew. In the 70's unexpected events, such as the oil crisis, inflation and shrinking markets forced upon the companies the need to rethink planning methods, going beyond predicting the future as an extrapolation from the past (Hansen & Juslin, 2018). From the 70's to the 80's planning was no longer an exclusive executive role but included other management levels. Managers started to look into signs of trends that could impact their markets and operations (Mintzberg, 1978; Wack, 1985; Hansen & Juslin, 2018). A new influence came from economists in the 80's and beginning of the 90's, with Michael Porter as its most prominent example. The fundamental questions from this school of thinking dwell on competitive advantage based on elements such as cost, product differentiation, market presence and optimization with commodity-based industries as strong adopters of this approach (Porter 1985; Bowman, and Carter, 1995, Mintzberg et al., 2005, Hansen & Juslin, 2018). With the experiences accumulated in the previous decades, concepts such as novelty, creative strategies and development of alternative futures were incorporated into company planning processes. Strategic thinking became a common term with more freedom of thought to look into different futures and incorporate uncertainty, while strategic planning, operationalizes those ideas (Hansen & Juslin, 2018; Ramirez & Wilkinson, 2016). In the beginning of this century, these concepts continued to flourish.

Commodity and commodity-like markets, such as agriculture and forestry (Hansen & Juslin, 2018, Prestemon and Buongiorno, 2012; Goergen et al., 2013; USDA, 2016) relied primarily on a low-cost/differentiation business strategy which still plays a significant role within these segments (Hansen & Juslin, 2011). This approach is being challenged to integrate turbulence and uncertainty (Hinterseer, T. et al., 2014, Ramirez & Wilkinson, 2016). These bio-based industries are highly reactive, relying on extrapolations from the past, to plan forward, assuming a stable future ahead. It is fair to say that these markets are more sensitive to turbulence and uncertainty, due to the basic needs of humanity, for food safety, housing and energy sources and the long-term perspectives for forest development (FAO, 2000;

Hengeveld et al., 2017; Hoogstra-Klein et al., 2016; Hurmekoski et al., 2018). The potential impacts of climate change and the perceived role to carbon emissions balance at global level are just two examples of how much these industries can be subject to uncertain futures (Maness, 2009).

2.2. North America Forest trends history

The US forest sector has a decentralized policy making system, reflecting the mix of land ownerships. Most of the forests are privately owned having the majority of Government lands in the west (USDA, 2016). After a steep conversion of forestlands into agriculture, a conservation framework was put into place in the 1900's with the goals to a) promote protection to forests and grasslands regardless of ownership type; b) acquire scientific knowledge on management of forests and wildlife and efficient use of wood products; c) preserve remaining government lands for permanent use, management and protection; d) improve management techniques and productivity of private forests through research and technical assistance to landowners. Especially US private forests are highly focused on commercial resource extraction, even though it has broadened in the last two decades, with its main market for housing and planning approach focused on mass production and low costs (Rich, 1986, FAO, 2000, Tidwell, 2011). Early documents from the 70's and 80's focused on goals such as forest productivity, land use change and forest fires (Rich, 1986, Oswalt et al., 2010). Moving into the 90's more concerns were highlighted, such as invasive species, diseases, forest health and market trade balance (Smith et al., 2009, Oswalt et al., 2010). Recent documents still list long standing concerns (Oswalt et al., 2010, USDA, 2012, Goergen et al., 2013, Bowyer 2016). On the other hand, particularly in the last decade, some of the "global events" became a constant in specialized publications, from the State level such as in Oregon (E.D. Hovee, 2004), the United States Forest Service (USDA, 2016), and the Food and Agriculture Organization of the United Nations (Prestemon and Buogiorno, 2012, Goergen et al., 2013), showing that awareness of the issues is growing. Themes such as certification, green-building market, sustainable production, and non-market attributes of forests are "newer" themes, arguably, indirect consequences of the global events listed. The industry's organizing template was established in the first decade of the 20th century and as challenges arose, they have been addressed in the context of this template, with relatively modest modifications over time (USDA, 2012, Goergen et al., 2013).

The Pacific Northwest industry faces a unique collection of challenges such as restrictive environmental legislation, new international competitors, alternatives for wood products and the effects of global climate change and change of values within society (E.D. Hovee, 2004, Thomas et al., 2006, DellaSala et al., 2015). On the other hand, within a global society where social equity is gaining importance and environmental values are heightened, the push towards safe, low cost and environment

friendly products, indicates the important role forests and their industry can assume for environmentally conscious consumers (Stanturf et al., 2003, E.D. Hovee, 2004, Hansen & Juslin, 2011; Hurmekoski et al., 2018).

For both chapters, two and three, Background and Theoretical Background respectively, the review considered documents from the 1970's to the present, which coincides with the period since scenario planning began its use by civil organizations. The search focused on peer reviewed papers and studies developed out of the academy.

3. Theoretical Background

3.1. Scenario Planning

In the early days of October 1973, the world economy was hit by a political embargo as a response from members of the Organization of Petroleum Exporting Countries (OPEC) to the aid from US to Israel at the beginning of the Yom Kippur war. Oil exports were banned to targeted countries and production was reduced purposely (Milestone, 2016). As a result, crude oil prices rocketed from $3.00 per barrel in 1973 to $12.00 in 1974, making transportation more expensive for importing nations, and leaving citizens astonished, whose livelihood was affected at different levels across the globe. Allies within the North Atlantic Treaty Organization (NATO) adopted different international political alignments, siding with Israel or with OPEC countries. The perceived shortage of crude oil spurred investments in new areas such as alternative fuel and energy sources. Examples include, Brazil's revolutionary switch to running its vehicles on ethanol from sugar cane (Alpanda and Peralta-Alva, 2010) and the increased oil prospection in different regions of the globe, like Alaska, the Caucasus and the North Sea. The automotive industry migrated to higher fuel efficiency cars, opening and reducing markets for brands of different origins, totally reshaping the automotive industry (Macalister, 2011).

In the U.S., the economy had grown increasingly dependent on foreign oil (Milestones, 2016), and was acutely strained, which further deepened the crisis at a global level. To incentivize prospecting for new oil sources, the Nixon Administration implemented a new oil source incentive, where "old" oil (already discovered) had a max price limit and "new" oil (to be discovered) would receive a premium. The policy backfired leaving less "old" oil available, increasing scarcity, and discouraged investments in new energy sources (Frum, 2000). In 1974 a Federal speed limit rule of 55-mph was in place to enforce more fuel-efficient speed (Kamerud, 1988). By the 1980's big luxury cars production was significantly reduced in favor of more fuel efficient 4-cylinder engines. In many states citizens were required not to put

up Christmas lights and in Oregon, Christmas and commercial lighting were banned altogether (Frum, 2000).

Even though the Yom Kippur war triggered the oil shortage, a series of ongoing events was responsible for the profound crisis that followed. After a decade of existence, OPEC achieved an organizational maturity that permitted its members to exert economic and political strength taking advantage of the industrialized government's beliefs in a continued buyers' market (Morriss and Meiners, 2012). In 1971, the US and other industrialized countries pulled out of the Bretton Wood Accord, abandoning the Gold Exchange Standard to which the value of the dollar was linked. Currencies were left to rise and fall according to market demand and reserves were significantly increased, resulting in depreciation of the dollar and others. With diminishing revenues, OPEC countries started to price oil in terms of gold. With devaluated currencies, less oil and at higher prices the embargo was only the trigger to the crisis (Masouros, 2013).

Even though the reasons for such crisis went beyond the embargo, a fact is that energy policy in US and most of the world, rested on a comfortable prediction, that OPEC exporters could not or would not exercise their seller's power triggering an unexpected scenario (Barsky and Kilian, 2004).

In the aftermath it is obviously easy to assess past events and analyze reasons and outcomes. The real challenge is to identify what questions should be made, in particular, the uncomfortable and unknown ones before events happen. Tricky affirmative? While many countries and companies were surprised and negatively affected at different levels with the crisis, one company was developing a different approach when these events were happening.

In 1965, Royal Dutch Shell put into service a computer-based model to improve the company's planning capability, the Unified Planning Machinery (UPM). At the same time the company began a new initiative, "Long Term Studies" (LTS) which was the beginning of an ongoing effort to develop long-term outlooks in the form of alternative plausible futures (Wilkinson and Kupers, 2013). In 1971 it was clear that UPM could not cope with the extended time horizon needed for the oil business endeavors and most importantly, it failed to account for potential changes in the business environment identified by the LTS initiative. In the early 1970s UPM was shut down. At the time, Shell identified the possibility of power shifting from a buyer to a seller's oil market, with the oil producing nation's interests driving production and cuts, instead of a constant increase market demand foreseen in a business as usual version of the future (Wilkinson and Kupers, 2013). With this approach, when the crisis hit in full, the company was envisioning to diversify investments looking into alternative energy sites and sources. Most remarkable was Shell's pioneering efforts in developing the oil fields in the North Sea, the most difficult offshore work the Group had ever undertaken pioneering the push into deep water technology and production

(Shell, n.d.). When the second oil crisis came at the end of the 70's, the Group renewed its search for non-OPEC sources of oil and sought further diversification into renewable energy. It also moved into other areas such as forestry, construction and alternative fuel. Out of this came it's interest in biomass integrated gasification, and eventually the new biofuels of which Shell is today the world's leading distributor (Shell, n.d.). This is not evidence that Shell can anticipate future changes better than other companies. What is perceived by researchers is that its approach renders the group more sensitive to shifts in the market and culture (Wilkinson and Kupers, 2013). The approach has improved the company's strategic planning, incorporating unpredictability in the thinking process, which came to be known as Scenario Planning (SP).

Even though it is not a recently developed tool, SP gained importance as strategic planning evolved. Since the beginning of the Cold War, scenario planning has been used to integrate uncertainty in strategic planning for military purposes. In the 70's Shell brought these tools into the market realm and they slowly gained importance. It was not until 2001, with 9/11 events, that scenario planning tools had a surge in adoption, climbing 70% in use at global level, double the average of the previous decade (Rigby and Bilodeau, 2007). These tools have been used in a wide variety of areas, such as the military (nuclear war games) (Wilkinson and Kupers, 2013), business decision making (oil crisis) (Wack, 1985), political outcomes (South Africa's path out from apartheid) (Kahane, 2012) and human health (UN AIDS program in continental Africa) (Fourie, 2004).

In developing ways to integrate uncertainty into planning processes, differences between practitioners arose, varying from the definition of scenarios up to methodology (Mulvihill and Kramkowski, 2010, Hoogstra-Klein et al., 2016, Ramirez & Wilkinson, 2016). Reasons for such variations can be from conceptual interpretations of different users, their goals and objectives (Hoogstra-Klein et al., 2016). Building on the differences and experiences since the 1970's, different approaches to scenario planning were developed out of various school of thought (Ramirez & Wilkinson, 2016, Hoogstra-Klein et al., 2016), which are important to understand before proceeding in any study. In 2011, Thomas J. Chermack described in his book "Scenario Planning in Organizations: How to create, use and assess scenarios", the major approaches to the methodology:

Royal Dutch/ Shell and Global Business Network (GBN): Born from professionals from Shell's scenario division, naturally the GBN approach is strongly based on Shell's application of the tool. As devised by Pierre Wack, the big picture of a task comes first, zooming in later to the details, to avoid missing key dimensions of the building process. The approach follows an eight step process that starts with identifying a central issue and developing the scenarios outwards toward the external environment. The following steps seek to identify key forces around the issue, brainstorming on the driving forces from the

macroenvironment and ranking the results of both steps according to two criteria: a) the degree of importance for success; b) the degree of uncertainty around these forces themselves. At this stage stories start to be developed for potential scenarios, with the goal to shed light onto the central issue. The next step is to introduce and check the logic of the scenarios according to the matrix developed from the ranking of the forces. After this, starts the selection of the scenarios which will have their plausibility constantly checked as the scenario evolves. The last two steps seek to examine the implications of each selected scenario, testing them against the central issue and their robustness. This is done challenging them with questions such as: "What will we do if this is a reality? Does a decision look good across only one or more scenarios? What vulnerabilities have been revealed?" (Chermack, 2011. p. 20). The last step seeks to select leading indicators that can help to monitor and identify unfolding events in relation to scenarios developed.

French School: This approach is based on "perspective" being divided in two categories: 1) Situational scenarios, which describes potential future realities; 2) Development scenarios, which develops a sequence of events that can lead to a future reality. Within each category three types of potential scenarios are identified: a) trend-based scenarios, which follow what is most likely to happen; b) contrasted scenarios, which explores purposefully extreme themes; c) horizon/ normative scenarios which explore the feasibility of a desired future, working backwards from the future to the present (Chermack, 2011. p. 21). This approach is a structured study, with detailed and quantified elements that are compiled into a database. It is divided in three phases. Phase 1, studies internal and external variables related to an issue or question, that produces a cross impact matrix to understand the influence each variable has on each other. Phase 2, explores the range of possibilities, seeking to reduce uncertainty through the identification of variables and strategies. Future possibilities are presented as a collection of hypotheses, which may identify trends within the data. Software is used to reduce uncertainty by "estimating the subjective probability" in different combinations within the variables. Phase 3, the development of the scenarios take place, being bounded by the collection of selected hypotheses. Scenarios are built describing the route of events, from the present to the future.

Futures Group: developed by a Connecticut consultancy company, the approach is based on a trend-impact analysis to scenario planning. This method is structured with three phases: preparation, development and reporting and utilizing. The preparation phase consists of defining the focus or decision to be explored and describing the driving forces related. Several questions should be addressed, such as: "What future developments need to be probed? What variables need to be looked at for assistance in decision making? What forces and developments have the greatest ability to shape future characteristics

of the organization?" (Chermack, 2011. p. 21). The development phase consists of developing potential scenarios from the forces described, discarding non-plausible or illogical situations and defining a number of future stories to be studied as not all possible stories can be studied. The trick is to develop plausible stories that will challenge the common thinking. Still in this phase, scenario contingent forecasts are prepared with a goal to list trends and events that would be necessary for a plausible scenario to become true. For the different scenarios developed, a collection of indicators is selected so they may "signal" the direction an organization is heading. The reporting and utilizing phase is briefly covered, with few details. Futures group is one of the few approaches that considers this phase.

Decision Strategies International: This approach has similar origins to the GBN approach, with similar tasks, being more stratified. Instead of 8 steps it has 10. It starts with defining the scope of the project, including defining a time frame by examining past rates of change and estimating the expected future rate of change. As described by Schoemaker, (1995, p. 28) "The unstructured concerns and anxieties of managers are good places to start". Next, the main stakeholders are identified and the roles they may have played. The basic trends are identified in step three. These can consist of political, economic, societal, technological, legal and environmental. In step four, the main uncertainties are explored, the most turbulent areas will be assessed, seeking to identity main trends and uncertainties. Initial scenarios are then developed through paths such as looking for extreme worlds, segregating all positives and negatives in different futures. The initial scenarios are tested for plausibility. From the general themes that should emerge from the plausible scenarios, learning scenarios are developed by manipulating possible outcomes, giving more or less weight to them, in different plausible futures. These are used to identify areas that require further study, also called "blind spots". Scenarios are reassessed again for internal consistency and quantitive models normally are developed or applied at this stage. In the last step, scenarios to be used for decisions are selected (Chermack, 2011).

Wilson and Ralston: It is considered one of the most detailed description of procedures for scenario planning also based on the Shell method, with a few modifications throughout. Developed as an all-encompassing manual for corporate executives, it consists of 18 steps, which in many cases are a stratification of the GBN and the Decision Strategies International (Chermack, 2011).

Lindgren and Banhold: This approach is also called the TAIDA method which describes its structure: Tracking, Analyzing, Imaging, Deciding and Acting. According to Chermack, (2011), it is a simplified version of the intuitive logic approach, developed and applied by Pierre Wack, at Shell, to be used by practitioners as a shorthand manual, with a useful appendix of methods to be assessed.

Reference Scenarios: This approach was developed by Ackoff (Chermack, 2011), who described four modes that organizations have to cope with change: 1) Inactivity, where an institution ignores change and continue as business as usual; 2) Reactivity, where an institution reacts to change after it happened; 3) Preactivity, where an institution tries to predict change and prepare itself before it occurs; 4) Proactivity, where institutions interact with the external environment to develop a future for its stakeholders. Ackoff developed the term Reference scenarios to address a future where no significant changes happened and is used as a standard to be compared to. The other extreme is an ideal scenario of a desirable future. According to the author it should be "interesting and provocative" (Chermack, 2011, p. 25) and show what to change to avoid problems in an institution, within a given reality.

Procedural scenarios: Different authors developed their method very similar to each other. Chermack, (2011), classifies them in the same approach. This method relies on computer driven models and is cited as a good example of procedural scenarios that incorporate intuitive and quantitative methods.

Industry scenarios: This scenario approach is based on Michael Porter's assertions (Chermack, 2011). It is based in that the proper unit of analysis, in competitive strategy, is the industry itself. This approach defines industry scenarios as the "primary, internally consistent view of how the world will look like in the future". Chermack (2011) states that for Michael Porter, the industry scenarios can help an organization to analyze particular aspects of a business even though there are diverging opinions that suggest that with a narrow focus, you can miss key dimensions at large (Chermack, 2011).

Soft Creative Methods Approach: This approach consists of three phases: 1) Analysis, where members of an organization are brought to a common understanding of a problem. With the consensus the problem can be further explored, defining boundaries, structure and variables. To this end, it is recommended to use "soft creative methods" including morphological analysis, brainstorming, brainwriting and the Delphi technique" (Chermack, 2011, p. 26), 2) Description of future states, where the development of the possible paths for variables chosen are examined, 3) Synthesis, when interdependencies among the variables are explored, to build different situations for future scenarios. These scenarios are fed to computer models dependent on linear programming and cluster analysis (Chermack, 2011).

It is important to understand that scenario planning is not about predicting the future, it is a breakaway from assuming the future will be stable repetition from the past, exposing and questioning the official version of the future (Wilkinson and Kupers, 2103). Its value lies in that it provides vital links between organizational processes such as strategy making, innovation, risk management, public affairs, and leadership development. It helps to break ingrained habits opening the minds of decision makers to novel, less comfortable, and weaker signals of change, previously inconceivable or imperceptible.

Scenarios have the power to prepare strategy planners and institutions for discontinuity and surprise (Wilkinson and Kupers, 2013).

3.2. Scenario planning in forestry

In recent years, scenario planning publications seem to be growing around the world in forestry studies and certainly becoming more relevant in education research. Still very few were found within US and to the extent of this research, none was found regarding studying forestry higher education.

Using key words such as: scenario planning, forestry, forest, backcasting, alternative future, United States and US, 35 publications, screened by relevance, were assessed for this project. From these papers most were developed in Europe, Indonesia, Australia and Canada. A few studies developed for US were mostly related to climate change and ecosystem services such as Lawler (2009).

The most relevant work found was the Integral project, a four-year study developed in Europe for the forest sector (Hoogstra-Klein et al., 2016; Hoogstra-Klein and Schull, 2017; de Bruin et al., 2017). European scholars and practitioners intensified in the early years of this century the search for new ways to improve the study of future uncertainty in the forest sector (Hoogstra-Klein et al., 2016). In 2011, under the EU FP7 Seventh Framework Programme, the Integral project (Future-oriented Integrated Management of European Forest Landscapes) a scenario/backcasting approach, was applied to 20 locations within 10 different countries, during a four-year study period (2011 – 2015). A total of 80 different scenarios were developed. The participative study was key to the development of the project, including agencies, industry, landowners and the experts (Sandström et al., 2016, Wodschow et al., 2016, Hengeveld et al., 2017). A comprehensive search of the literature revealed no other similar projects. The Integral project combined a scenario/backcasting approach and was an inter and trans-disciplinary three step study, where: a) factors in domains that influence European forestry activity, such as society, technology, economy, ecology and policy were identified; b) exploratory scenarios were developed, consisting of coherent storylines, about plausible and alternative futures based on the influencing factors, and the impacts these could have in the future; and c) a backcasting, based on the scenarios developed, was generated starting from the same end point in time, in the future (Hinterseer et al., 2014, Sotirov et al., 2015). By backcasting the same end point in all future scenarios, it became possible to consider key future uncertainties and scenario-specific actions, seeking to determine policies and management strategies needed to achieve desired future scenarios (Sotirov et al., 2015, Hengeveld et al., 2017). The comparison of strategies from different scenarios also helped to determine the effectiveness of a strategy under several scenarios or its robustness (Sotirov et al., 2015, Hengeveld et al., 2017). According to the authors (Sotirov et al., 2015, Hengeveld et al., 2017 de Bruin et al., 2017), the Integral approach

combined with forest policy analysis and forest management modelling, can be an important tool to better anticipate and shape uncertain futures.

The Integral project did not deal directly with issues related to the forestry higher education system, but members of the academy were included as stakeholders and analysts. On the other hand, the project did deal with fundamental questions of the sector and included concepts of uncertainty in planning for the future. It can be a good reference to look into the future of higher education in forestry. The present study was developed at Oregon State University, College of Forestry (CoF). According to the Center for World University Rankings (CWUR), the college ranked in 2nd place among Forestry Universities around the world, regarding number of research papers published in top-tier scientific journals (CWUR, 2017). Respectively it ranked in 1st place within higher education institutions in forestry in the US (CWUR, 2017). The institution also ranks among the top ten in the country, based on different standards such as education quality, average earnings of graduates, accreditation, and other relevant factors (College Factual, 2018). For the purpose of this study, these facts support the choice of the CoF.

The Integral approach carries similar elements to the Oxford Scenario Planning Approach (OSPA), which prioritizes individual and organizational learning as the basis for competitive advantage (Chermack, 2011). The essence of the strategic learning process lies in the, "ability to re-perceive self-interest and options, and others interests and options and experience all enabled through a process of reframing" (Ramirez & Wilkinson, 2016, p. 3). In other words, it bases it's study in the capacity to reframe a person's thoughts by comprehending the boundaries that have been used to make sense of and intervene in the world, as well as what has been left out of this frame. The method considers four aspects of potential disruptions: Turbulence, Uncertainty, Novelty and Ambiguity or TUNA. In the OSPA method one learns about the present from a perspective of a plausible future, not about the future from the perspective of the present. This method has been used for over 45 years, being applied and tested in the areas of business, politics and health and is documented in a collection of academic papers (Ramirez et al., 2008, Chermack, 2011).

4. Methods

The population identified for the project is the members of the Academy or Academics, meaning Faculty and Graduate students, from the College of Forestry at Oregon State University.

As the college is structured in three different departments: Forest Engineering Resources and Management (FERM), Forest Ecosystems and Society (FES), and Wood Science and Engineering (WSE), each with their own identity and focus (COF, 2018), they were considered as different stakeholders participating in the study. The project consists of three phases, as follows:

Phase 1: Assessment of secondary data seeking to identify similar projects developed in the past and identify main trends published in specialized publications.

Phase 2: Application of the proposed tool of study to a group of graduate students and faculty from the College of Forestry in a workshop.

Phase 3: Interviews with workshop participants.

In Phase 2, the original proposal was to have two separate workshops, one for students and a second for faculty. The student workshop did happen exclusively with students, but the faculty workshop was conducted with a mix of faculty and students, named the "academy" workshop. The change became necessary due to a lack of faculty participants. The student workshop not only gave me experience but also helped improve via feedback from participants. The suggestions were used to improve the study in the academy workshop. (Table 1). The study, for both workshops, consisted of the same two steps, as follows:

- Workshop for the development of two contrasting scenarios, using scenario planning approach and selection of one scenario for study;
    - Application of a survey to participants to evaluate the tools used.

Table 1: Distribution of activities

ACTIVITY	**PHASE 1** Secondary data Assessment	**PHASE 2**orkshop student / academy	**PHASE 3** InterviewInterviews
Literature review (LR)	X		
Scenario planning (SP)		X	
Quality Interview (QI)			X

For Phase 2 the scenario planning step was performed within two workshops and followed by an interview as follows (Figure 1):

Figure 1: Study flow diagram

4.1. Secondary data assessment (Phase 1)

Secondary data was assessed seeking to identify similar projects developed in the past and identify main trends published in specialized publications. The review included papers from 1970 to the present. The search considered: peer reviewed papers from Google Scholar and specialized journals, and studies

developed outside the academy that could contribute to the understanding of the collective knowledge on the subjects of interest (Churchill and Iacobucci, 2015). For the second source of data the search included publications from Government institutions and governance agencies like:

- FAO, North American Forest Commission
- United States Department of Agriculture (USDA), Forest Service
- United Nations Economic Commission for Europe (UNECE)
- World Economic Forum

A comprehensive literature search was developed on themes such as: higher education trends, scenario planning, forestry trends and strategy approaches. When necessary, other areas of study were also assessed as complementary to the study. To improve the quality of the information for this study the main search effort was on scientific papers, followed by information from reliable institutions and agencies.

The following two phases consist of the same three activities presented above. The tools will be presented in detail in Phase two and referenced in Phase three.

4.2. Study approach: (Phase 2)

As mentioned, Phase two workshops were very similar, varying only on the composition of the subgroups. The similarities include the sampling approach and the methods applied in the study.

4.2.1. Population and Sample

For the present study the population is defined as members of the College of Forestry academy that are current graduate students and faculty on campus (Table 2).

From the population two subgroups are characterized for study:

- Graduate students: PhD, MS

- Faculty: extension, researchers and professors

Within the faculty subgroup, visiting professors and professionals were not considered. With respect to students, professional masters and online students were not included as they had a lower probability to participate throughout the whole process.

Table 2: Population of forest academy members from OSU College of Forestry

Institution	Department	Faculty	Grad
Oregon State University College of Forestry	Forest Engineering, Resources and Management	36	51
	Forest Ecosystems and Sciences	36	37
	Wood Science and Engineering	12	34
	Total	84	122

Source: COF department website and personal communication for fine tuning.

The study sample will be purposively selected from members of academy, relying on the concept of the information-rich case. Harper, (2001) and Sandelowski (1995) state that purposive sampling of well-informed participants can be a better sample than large randomly selected participants, for in-depth study cases. This concept is applied by Welsh et al., (2008), on his study of University/Industry partnerships.

For the selection of participants, a champion from each department was identified among the respective faculty to select potential participants from both subgroups. The champions were defined as the Department Heads or another faculty member suggested by the Department Head. To each champion a letter was sent explaining the goals and the exercise (Annex 1). With support from the champions an invitation was sent by email to all members of both subgroups with a briefing, explaining the goals and the exercise ahead (Annex 2).

The criteria for candidate choice was strongly related to interest and time availability to be able to participate throughout the whole project (Malhotra et al., 2003), which included the workshop and an interview. From the group of respondents, with help from the Champions, the intent was to have a minimum of two members from each subgroup, from each of the three departments, totaling 6 participants from graduate students and 6 participants from faculty in Phase 2. As explained above, this was not possible, and the distribution of participants was as follows (Table 3).

Table 3: Distribution of participants by Department

Phase 2	Workshop Graduate students		Workshop Academy	
	Grad	Faculty	Grad	Faculty
FERM	2	0	0	0
FES	1	0	2	1
WSE	2	0	0	3
Total	**5**		**6**	

4.2.2. Graduate student workshops

Even though the present study uses the Integral project as a reference, as mentioned above, the scope is different and resources available are significantly smaller. For this reason, adaptations to the approach were made. According to Ramirez & Wilkinson (2016, p. 118), it is possible to expect that hybridization of methods to apply scenario planning will emerge. The present project was developed by combining methods that include mapping of uncertain factors and developing two contrasting scenarios. From these scenarios one was chosen for further study as a theoretical exercise, with the students proposing a strategy to cope with it.

Scenario Planning:

The scenario planning workshop was split into two days of three hours each, and a third day with two hours. Each occurred one week apart. The group consisted of five participants and one moderator.

Prior to the workshop a study case was sent to the participants with a goal to introduce them to the scenario planning tool and a brief explanation of the exercise (Annex 3).
The structure of the workshop was as follows:

Day 1

Opening of the workshop with a presentation which contemplates:
(10 minutes presentation and 10 minutes for questions)

a. The goal of the project and objectives;
b. The core concepts of the OSPA;
c. Importance of the Endpoint,

The core of the presentation relates to the concept of reframing and re-perceiving. Below is the representation of how the process flows to achieve the two concepts above.

The approach used was the Oxford Scenario Planning Approach (OSPA) which is based on the Shell approach described in the theoretical background. The approach was chosen because it strongly emphasizes the need to question standard or normalized perceptions of trends, which tend to discount events such as turbulence and uncertainty, and under-value the role novelty and ambiguity may play in the future (Ramirez & Wilkinson, 2016). The moderator received training on the approach and method at Oxford University in 2016.

There are key premises that underlie the OSPA. These are the foundational ideas that support the approach (Ramirez & Wilkinson, 2016, p.6-14):

- Realization that there are unprecedented situations, caused by Turbulence, Uncertainty, Novelty or Ambiguity (TUNA).
- To assess TUNA conditions, new approaches are needed to strategic and policy planning. A better balancing of the attention is advised, increasing more focus on the future.
- To deal with uncertainty more flexibility in the thought process is necessary.
- Learning can be enriched within a social setting.
- The "aha" moment only happens after the reframing cycle is completed. It is personal, and no standard number of cycles exist.
- The approach enables individuals and organizations to identify new opportunities and more and better options.
- Scenario planning can help develop new social capital.

The essence of the OSPA approach lies in the ability to re-perceive ingrained concepts, of an individual or institution, and other's perceptions and experiences to the context in focus. The approach prioritizes the individual and organizational learning and is an interactive process, where the participants are considered learners. This also means taking a person out of their comfort zone and seeking beyond the safety offered by predict-and-control planning model approaches (Ramirez & Wilkinson, 2016), shifting from predicting to reframing.

Reframing is at the core of this approach. It helps learners to clarify their own boundaries of thought and expectations and makes it possible to look further. As stated by Ramirez & Wilkinson, (2016, p.4) "Reframing helps people become mindful of the paradigm they have been using to make sense and intervene in the world, as well as what is left out of the frame". Even though it is possible to do at a personal level, the exercise is boosted through collective learning, when different framings of a situation are exposed into a strategic discussion, and each participants concepts are challenged with new knowledge generation (Ramirez & Wilkinson, 2016). It is important to understand that the exercise happens through strategic conversations, where new and different ideas and perceptions become clear and that to be successful it is necessary to accommodate disagreement and render it a productive asset (Ramirez & Wilkison, 2016). The process to achieve the goals above can be represented graphically as follows (Figure 2).

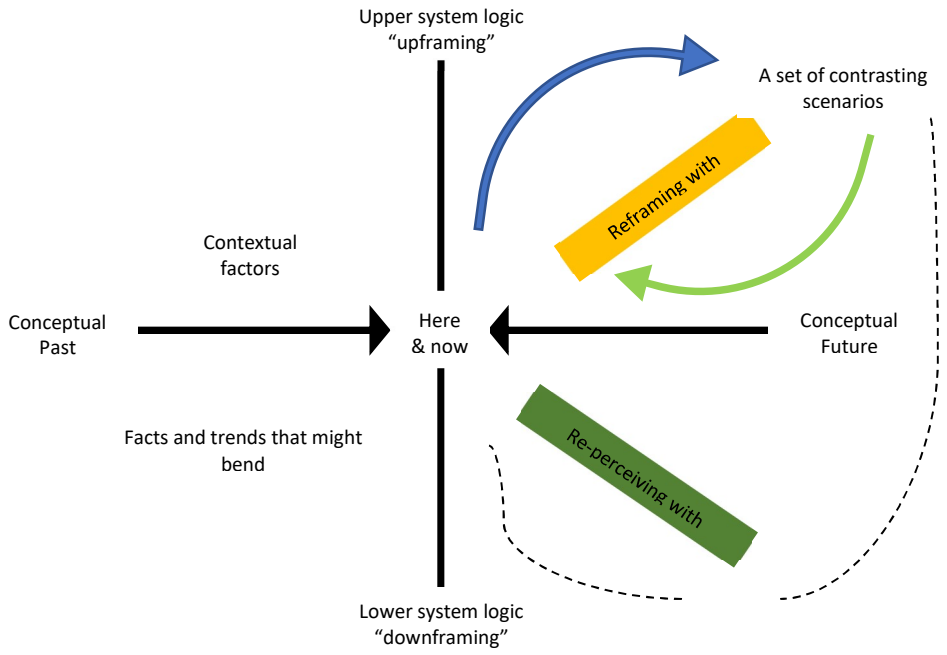


Figure 2. Reframing and Re-perceiving in scenario planning. Adapted from Ramirez & Wilkinson (2016)

In the graph above, the situation, defined as where the learner is located, moves along the time axis (the horizontal line). As in predictive approaches, past experiences and knowledge flow into the present. Scenario planning adds another dimension, reflected on the vertical axis, whose ends are the higher system logic (upframing) and the lower system logic (downframing). The learner takes a wider view of the context, which is represented by the upframing. This view is orthogonal to the timeline in Figure 2. To assess this "bigger picture" incentivizes the learners to broaden their perspective and look at the breadth of the context of the situation at that point, while moving along the time line, always with the conceptual future in mind. It is important to highlight that in this dimension, the future is coming towards the present (Figure 2). This "upframed" knowledge works at a higher logic order that can promote insights into new factors and unseen connections among them. In the downframing, learners then immerse themselves in the new conceptual future to study the existing and new courses of action and to understand how stakeholders might react under each plausible future scenario context. This process permits learners to re-perceive the situation and reassess strategies and approaches, promoting openness to new ideas and options (Ramirez & Wilkinson, 2016). The learning manifests through the discussion of how the transactional environment might be affected from a combination of the impact from factors from the

contextual environment. The learners revisit the process for the future context, developing links between events in space and time and devising a conceptual future (Figure 2).

Reframing and re-perception happen concomitantly, feeding and supporting each other. This relation is represented in Figure 3. The presentation continues with the method to be used for the development of two contrasting scenarios.

Ramirez & Wilkinson (2016) believe there is no single method or way to develop a scenario planning study. The authors suggest that the best approach is understanding and adaption, presenting choices that best support the objectives or the learner. For the purpose of optimizing time, the Deductive method will be presented to participants for the development of the exercise. The method utilizes the reframing/re-perceiving exercise and is commonly used.

Deductive method: The method involves identifying and analyzing uncertainties that are not foreseen or avoided in the contextual environment which could be disruptive, positively or not, within the horizon

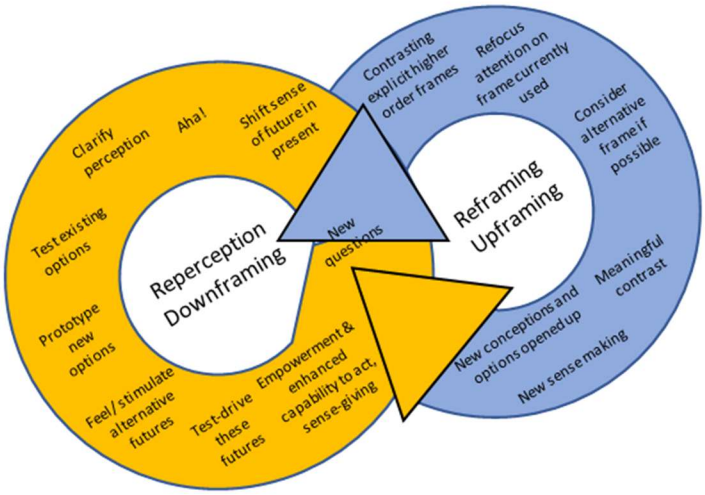


Figure 3. Interconnections between reframing and reperception.
Source: Adapted from: Ramirez & Wilkinson, 2015

defined. These factors become key drivers of change. From these two or three drivers that are independent of each other, a cross impact matrix is developed normally in 2 x 2 (Dimensional) or 2 x 2 x 2 (three dimensional). This framework serves to identify logical combinations of scenarios that best serve the goals and the learner. For example: a matrix with axes such as:

economic growth x environmental quality;

environmental consciousness x greenbuilding x average income.

In this method the structure of the scenario is finished prior to its content. The extremities of the axes can be either/or more-or-less. This choice is significant as in the case of "either" the chosen factors

form a 2 x 2 axis which are mutually exclusive and only one scenario can come out of the matrix. In the second case “more-or-less” in a same 2 x 2 axes, as the factors are not mutually exclusive, several scenarios can emerge simultaneously (Ramirez & Wilkinson, 2016).

After defining the axis and the structure of the scenario, the next step is to fill in the contents to build the storyline. This considers, defining the details to be included, which are the key elements, system diagrams or event maps, scenario names, and all decisions permeated by its plausibility. The level of detail is linked to the level of reframing that was developed. The amount of resources, especially time, is highly relevant to this end. The content is supported by system diagrams and event maps, which become the storyline. System maps are the facts or events that happen independent of time. The Deductive process stream is represented in Figure 4.

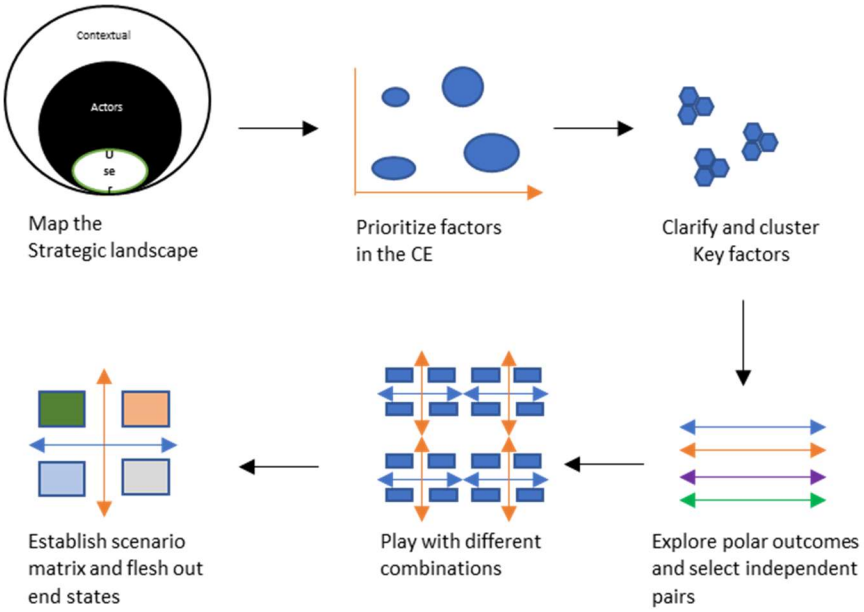


Figure 4. Deductive process stream.
Source: Adapted from Ramirez & Wilkinson, 2015

With the outcomes from the questions above in mind, the group was then challenged to develop two contrasting scenarios, responding to the workshop question: What will be the role of higher education forestry institutions in the future?

Official future

Due to a significant number of questions the students had regarding the development of alternative futures, that diverge from the official future, a modification to the OSPA approach was introduced to facilitate understanding of the topics. Basing on concepts from the French school and the Reference scenario school, the students were asked to discuss and write on the board what they expected that higher education would be or how the OSU College of Forestry would look like at an endpoint they defined. The expected future was named, the "Official future" and then the students were challenged to develop two alternative scenarios that were different from the "Official future".

Due to the addition of this step, I decided to not develop another planned step, called "Social context of time". The decision was made as both are tools to help the understanding of the method in different ways and to be able to achieve the goals of the workshop in the time available.

Trends and scenarios

To contextualize the following discussion, the main trends found in the literature review for the sector were presented in a five-minute presentation. The participants were asked if those were the true trends that can best describe the future? If there is any other missing? *(5 minutes)*

As a group, the learners defined which were the trends they included in the figure drawn on the board within the outer sphere (Figure 5). These factors become the "Driving forces" for the sector, representing the contextual environment. The participants then deliberated which were the closer actors that related to the academy within the contextual environment, these were placed in transactional environment sphere (Figure 5).

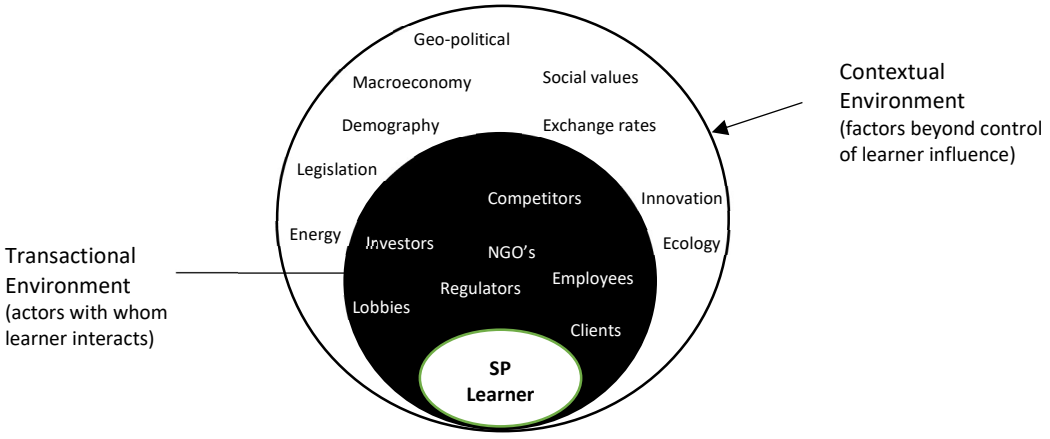


Figure 5. Contextual and transactional environment. (Adapted from: Ramirez & Wilkinson, 2016)

To help organize and visualize the information developed, the learners brainstormed to cluster the "drivers" and classify them according to their impact and uncertainty level (Figure 6).

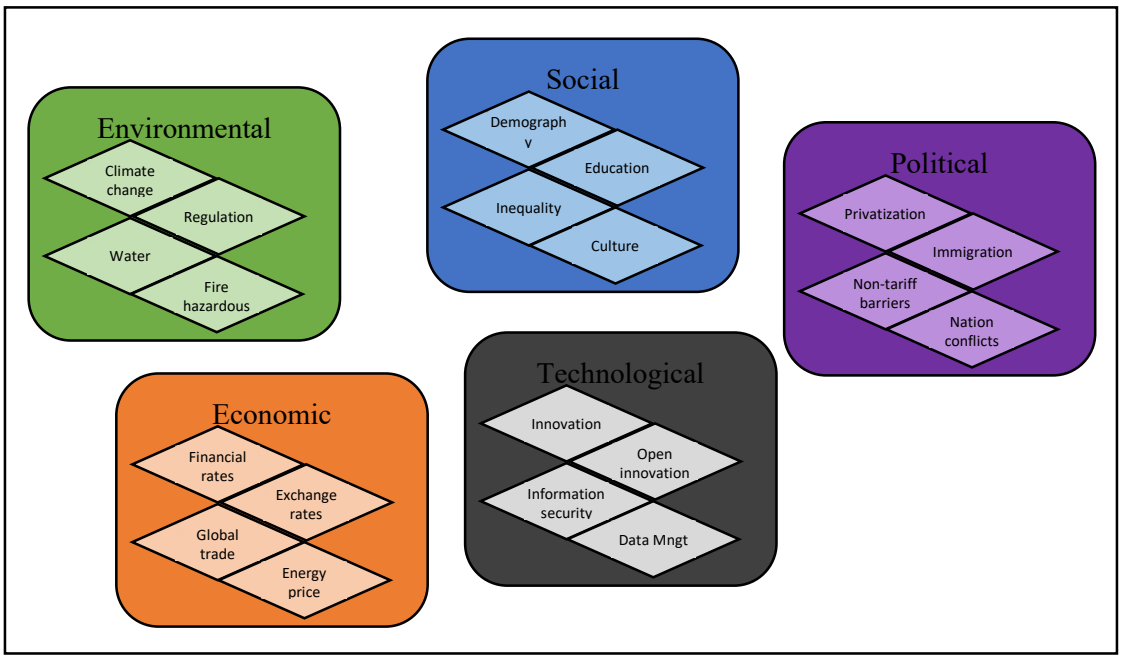


Figure 6. List and cluster "drivers". (Adapted from Ramirez & Wilkinson, 2016)

Among the "drivers" they can be organized in two types regarding their uncertainty, a) Critical uncertainties: What are the crucial unknowns? Which factors likely have a big impact, with uncertain outcomes? b) Pre-determined: inevitable elements that have occurred or are most certain to unfold, but for which the consequences have not taken place yet. The participants, as a group, did deliberate and allocate these "drivers" with the objective of identifying which were the "Critical driving forces" for the study. This task was done conditioned by two questions (Figure 7):

- What is the level of uncertainty? Classifying the factors from low to high;
- What is the level of impact? Classifying the factors low to high.

The group then focused on the top right side of the graph (Figure 7) to identify the critical driving forces. These combined the highest uncertainty with the highest impact. The group then explored combinations in two by two factors, to check for their outcomes and only consider the pairs that are totally independent from each other. Example to avoid: interest rates x bank loan growth. From the factors selected, their respective polar outcomes were then characterized: Example, Technology intellectual property (Open access to Closed proprietary). It is important to highlight that many combinations of pairs of critical driving forces can be taken from the exercise and used independently to develop different outcomes of scenarios to be compared. For this project, even though approximately two hours were allocated for the scenario development, only a few were possible to develop due to time restrictions.

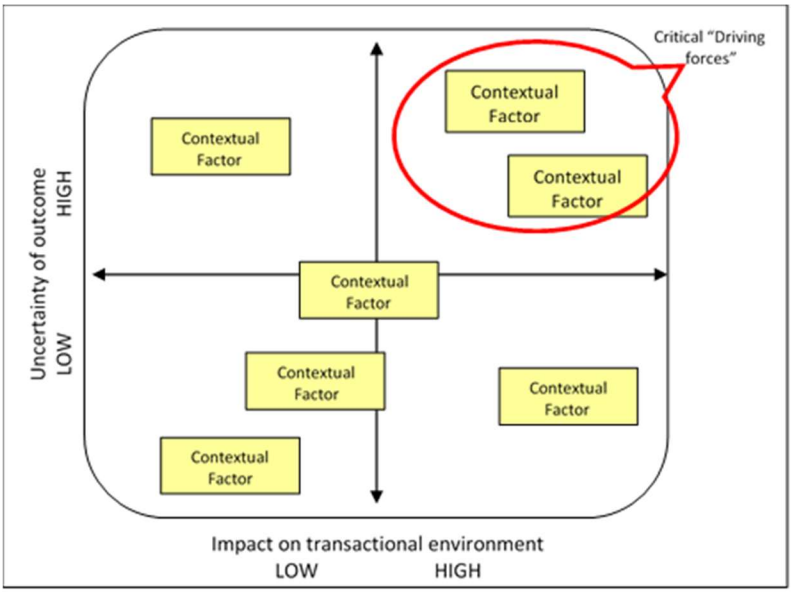


Figure 7. Critical "Driving forces". Adapted from Ramirez & Wilkinson, 2016

The combinations are explored by pairing critical driving forces, examining their polar characteristics against each other to generate four different scenarios (Figure 8).

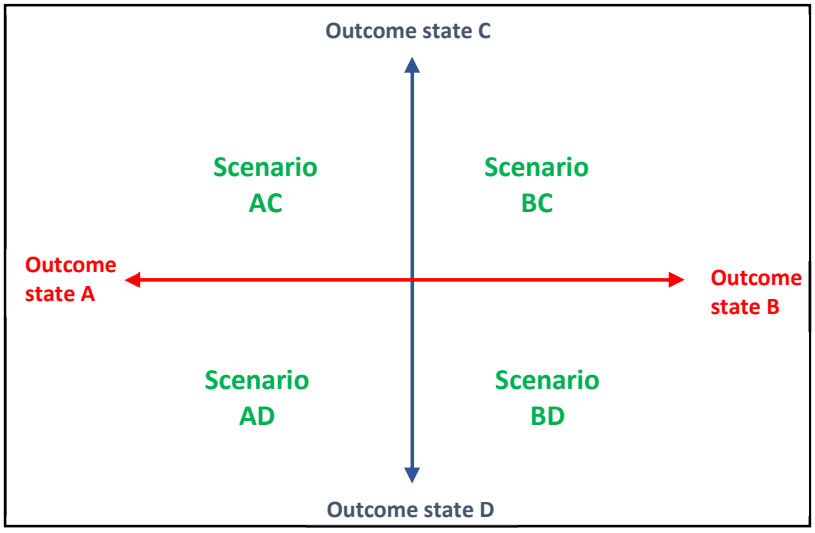


Figure 8. Possible scenarios. Adapted from Ramirez & Wilkinson, 2016

From the combinations tested, the participants decided which pair to deepen the study on. To help their decision the selected drivers had to be:

- Relevant to the client's purpose. Ask the question, why do these stories need to be told?

- Plausible to happen in the future, within the Endpoint established. Check if one or two quadrants seem completely implausible. Ask, could or how could they be made plausible?
- Challenging: Is it possible to identify an "official future" quadrant? Are the other scenarios too comfortable or familiar?

When the group identifies a combination that meets the above, the structure of both scenarios should be developed and become clearer. The learners then named the different scenarios and choose two to further develop a storyline. This is very important as it summarizes the identity of the scenarios developed by the group (Figure 9). It is important to highlight that the contrasting scenarios do not need to be "bad" against "good". A combination of both characteristics is advisable (Ramirez & Wilkinson, 2016).

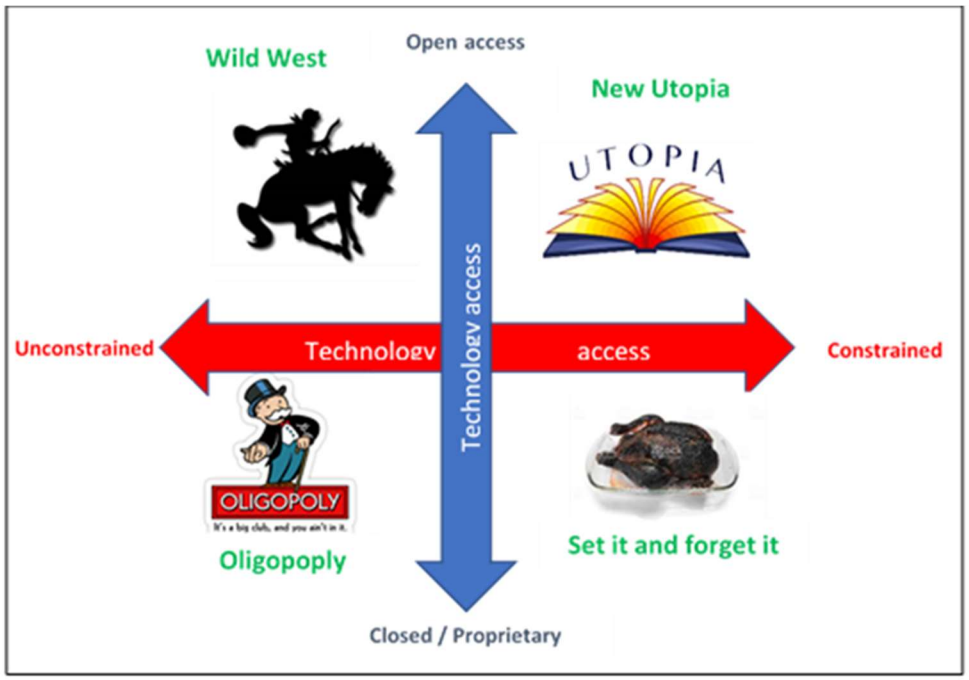


Figure 9. Naming scenarios. Adapted from Ramirez & Wilkinson, 2015

Day 2

On day two, the goal was to revisit the two scenarios developed on the first day. Any corrections or additions by the learners were made. The final task was to develop the story line for both scenarios.

Storytelling

After defining the axis and the structure of the scenario, the next step is to fill in the contents to build the storyline. This considers, defining the level of detail to be included, which are the key elements, system diagrams or event maps, scenario names, and all decisions permeated by its plausibility. The level of detail is linked to the level of reframing that was developed. Sometimes a coarse and fast result is acceptable in facing a crisis, for example, while other situations demand a careful assertion of the facts. The amount of resources, especially time is highly relevant to this end. The content is supported by system diagrams and event maps, which become the storyline. System maps are the facts or events that happen independent of time. A good analogy is presented by Ramirez and Wilkinson, (2016), where the system map works as a guide to places a tourist wants to visit in Paris. The system maps show the locations and how to get to them. The event map links the facts or events to each other, in time. They are presented as time series of key developments that occur in the story. Normally there will be one of each, for a single scenario. Continuing with the Ramirez & Wilkinson, (2016) analogy, the event map would be like a tourist's calendar, where he identifies when such places can be visited and defines his agenda. When the learners put these together, the story comes to life (Ramirez & Wilkinson, 2016).

A short presentation at the beginning of day two focused on the premises above and discussed the main points of the storytelling. The main contents are described below:

To develop the storyline, it is important to identify what happens at the start, middle and end of the scenario. According to Ramirez & Wilkinson (2016) up to five stages in a story are memorable. It is important to keep retelling the whole story, attending for new elements while taking out spurious dimensions. It is important to continuously look for deeper patterns in the story until the group feels satisfied.

To develop storytelling an example is given by Ramirez and Wilkinson, (2016) based on Glenn and Gordan's, (2009), Futures Wheel. The method assumes that an event, trend or decision is given and explores the primary consequences that could possibly happen. From there the secondary consequences can be digressed and so on, forming a wheel of events, until a useful map is identified. The user should pay special attention to trend or event clashes as these are highly useful to identify new elements to describe the story.

Following the presentation, the remaining time of the workshop will be to develop the storylines.

1) The participants were oriented to take the critical driving forces that shape a scenario, explore how these forces are related to the scenario and sketch a system diagram.

2) The participants brainstormed the sequence of the events, how they integrate and use this to develop the story map.
3) The participants checked if the resulting story map has consistency, is plausible and relevant for the objective of the group.
4) The participants wrote a scenario narrative that corresponds to the sequence of events, containing a start, a middle and an end.
5) The participants enriched the story by considering which are the key players in the story, what are their actions, and when.

In the students' workshop the scenario storylines were not finished during the workshop. The information was collected, shared and a version of it was prepared by the moderator and sent to the participants for approval. All the steps were documented and the panels with ideas, trends and connections were registered.

The students focused on the development of the first scenario in the time available and a second one was not further developed. The participants were asked if they could meet again to develop a strategy to cope with the scenario they had developed. The group agreed to meet for another hour on a third day, after they had approved their scenario.

Day 3

The final version of the student scenario was presented and approved by the group. Then they were presented with the following challenge: pretend the Dean had asked the group to develop alternative scenarios and that this one in particular, he wanted to have a strategy developed to cope with it, in case it happened. The students then developed a strategy for the scenario developed.

4.2.3. Academy Workshop

On the Academy workshop, the same approaches and methods were used. The Phase consists of the same two activities: Scenario Planning, and interview, applied to the Graduate students.

The main difference was in the composition of the subgroup, which included faculty and graduate students. Other important differences in the process came from experiences from the Student workshop. These consisted of better ways to approach the activities, questions, and group coaching.

The development of the official future was kept and developed by the participants of this workshop and the exercise of the social context of time was reinstated as follows:

Social context of time

With the objective to give a social context of time, the process starts with the moderator asking the following three questions:

1 – Is there one future or many?

2 – Is the future in this room already?

3 – How are the past, present and future related to your organization?

The participants were invited to individually draw three circles representing the weight their organization gives to present, past and future. The figures were analyzed and contrasted by how much attention each period receives, looking for patterns such as size and position of each circle (eg., do they overlap) (Ramirez & Wilkinson, 2016). Led by the moderator, the results were used to reinforce the premises of OSPA and the concept that more focus should be given to the future when planning for the future.

The "Social context of time" exercise was presented and developed after the presentation of the challenges and trends for HEI's and prior to the presentation of the scenario planning approach and the development of the "Official future" exercise.

4.3. Interviews (Phase 3)

Primary data assessment

In-depth interviews were conducted with the participants of Phase 2 as follows in Table 4:

Table 4: primary data assessment, by departments, by Phase

Department	**PHASE 2** Graduate students	**PHASE 3** Academia	
		Students	**Faculty**
FERM	2	0	0
FES	1	2	1
WSE	2	0	3
Total	**5**	**2**	**4**

This method was chosen as it permits the respondent to more freely present their opinion and because interesting insights from the respondent can be pursued deeper by the researcher. A semi-structured, undisguised questionnaire was presented to all participants (Churchill, 2015). The Laddering

technique was applied, to encourage the respondent to go beyond their established rationale and reflect on their perceptions so they could elicit the higher or lower level abstractions of the concepts they presented during the interviews. (Malhotra et al., 2003; Churchill and Iacobucci, 2015). The questionnaire had open questions that were used to develop comparisons between respondents.

The subjects of the survey were contacted by email, presenting the goal of the research and guaranteeing the confidentiality of the answers. The interviews varied, between 20 to 50 minutes long.

Sample and data collection

The study population, consisting of the two subgroups, faculty and graduate students, were purposively interviewed as they are the ones able to evaluate the approach.

The sampling follows a convenience sampling, which is a non-probability sampling method (Malhotra et al., 2003; Hurmekoski et al., 2018). As stated by Malhotra et al., (2003, p.364), even though normally convenience samples are not representative of any population, it can be used in exploratory research for ideas and insights, which supports the nature and purpose of the project. As the survey is only used as an indication of the interest and feasibility of using the combined approach, no statistical testing for differences between the two subgroups were performed.

The interview questions were organized to help participants reflect on the relevance of scenario planning for the forestry academia and the feasibility of successfully applying the tool (Annex 4). Hengeveld et al., (2017) used a similar approach to evaluate the combined approach for the Integral project.

The questionnaire was structured in layers, defined as the Perception Chain. The perception had two goals, first to identify at what level the participants understood that scenarios could contribute and second, how did I as a moderator perform in communicating the related information. This was done by identifying in the responses the core premises of scenarios and its potential. As follows:

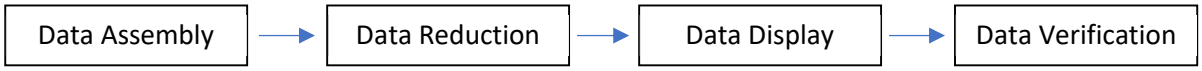
- Layer One: or personal level, seeks to explore the perception that each individual participant had from the impact that scenarios had on themselves.
- Layer Two: or client level, seeks to explore the perception that each individual participant had of the impact, challenges and benefits, that scenarios could have for the client. Theoretically, for whom the individual would be working for.
- Layer three: or related stakeholders' level, seeks to explore the perception each individual had of the impact, challenges and benefits, that scenarios could have for stakeholders closely related to the client in adopting scenarios. These can be represented in the "Contextual environment" of the of the OSPA method.

- Layer four: or an abstraction level, seeks to explore the perception each individual had of the impact, that the adoption of scenarios by a higher education institution (the client), could have on the external stakeholders related to the client. This relates to the assumption made in the project that another important role that HEI's could have, is to become a think tank for the related sector.

4.4. Data analysis

The analysis focused on the replies to the questionnaire and not on the scenarios developed. This should be left for other researchers in analyzing how the scenarios were produced.

The analysis of the interviews followed the guidelines of chapter nine of the Marketing Research book (Malhotra et al., 2003). The process considers four main steps:



Data assembly

Data assembly relates the possible different ways to gather information and data pertinent to the study. For the purpose of this study these included (Malhotra et al., 2003):

- Notes taken during and after the workshop and notes made during the interview;
- Reflections of the researcher/moderator involved in the data collection process;
- Theoretical support from secondary data or literature sources;
- The documents produced by the participants or sourced from the participants;
- Photographs and diagrams;
- Recordings and transcripts from interviews;

From the list above, the core of the data was extracted from the interview transcripts. Each participant had their interview transcribed individually, utilizing the "transcribing" software (Wreally, n.d.). This information was the essence of the project as it was the source of data to explore the potential usefulness and adoption of the method.

Evidently the outcome from the interviews are strongly related to the experience the participants had during the workshop. For this reason, the information collected from the workshop itself are displayed and briefly discussed throughout. This was supported by the documents and diagrams produced by the participants and by pictures of drawings made during the workshop.

The whole process was supported by notes and reflections made by myself as the researcher of the project and moderator of the workshops. These notes supported not only the understanding of the data but also strongly contributed to the improvements made in between the two workshops and the interview process.

Data Reduction

Data reduction involves the organization and structuring of the qualitative data (Malhotra et al., 2003). Reducing the data mainly involves the process of coding data which is done by breaking down the information collected into discrete chunks and attaching a reference to those chunks (Malhotra et al., 2003). For the purpose of this project the coding followed the three steps defined by Malhotra et al., (2003): Retrieve data, Organize data and Interpret data.

Retrieve data: all the transcriptions, were used while still kept individualized at this step. All responses for each question were assessed across the 11 interviews to identify the existence of general concepts and specific statements. These were highlighted, to become the initial ideas and terminologies utilized for potential themes and sub-themes.

Organize data: the information retrieved was used to cross examine with statements made by the same interviewee throughout the 10 questions. Information found in one question that related to different questions were re-organized. Also responses that supported answers to different questions were also analyzed if it offered clarification to ideas presented by a same respondent or in case they offered new insights to concepts not identified already. The next step was to re-asses each question, by comparing the organized answers across the 11 interviews. At this stage the data was organized by questions and not by respondent. Themes and sub-themes were revised when and renamed when necessary.

Interpret data: The analysis focused on potential similarities and differences identified among different answers for the same question. During this process the main focus was in identifying the relevance and feasibility in the application of the method. Also attention was given to innovative ideas in how to address challenges and opportunities declared by respondents and the level of understanding the participants had of premises related to scenario planning. At the end of this stage the core themes and sub-themes were clear and used to answer the objectives of this study.

Even though coding is stratified in steps, in reality it is a dynamic process that at any point, a meaning or realization of potential paths of understanding happen. This process was repeated more than once and at different numbers for each question.

Data display

According to Malhotra et al. (2003), data display involves summarizing and presenting to the public, in a clear and accessible way, the interconnections and external connections that the researcher made. It should be clear how a conclusion was made. When possible, these connections and interconnections were developed in a graphic form (Annex 9), for example, the questions where direct statements of facts were made. For others an interpretation was described, including the logic behind and spread sheets were also used. Based on the information developed the core themes were presented as the final interpretation. Also a separate list of positives and negatives of the mechanics of the tool itself was also presented.

Data verification

Data verification relates to identifying alternative explanations of interpretations made. Due to this project's exploratory nature, when possible cross references to other studies were made, but it was also used to develop theoretical determination of the interest and feasibility of applying the method in the forestry higher education environment, of the Pacific Northwest of US.

5. Results and Discussion

The results section is organized in four sections as follows: Section 1 – Higher education review; Section 2 – Graduate students workshop; Section 3 – Academics workshop; Section 4 – Interviews

5.1. Trends in Higher Education

5.1.1. The Academy – Global trends

There is no simple solution for the industry's challenges and no single player can solve all the problems. These tasks need the lead by the sectors stakeholders, either from the industry (through companies or associations), the Government (through its agencies) or from the Academy (through Universities and Technology centers). In a perfect environment, all stakeholders should undertake the responsibility to collectively address the present challenges and prepare for the sector's future, which, by itself, is no easy task to accomplish. Still in many cases one or more stakeholders work together to achieve specific goals, a common example is the partnership between institutions from the industry and

the academy. Naturally, within the context of University-Industry Partnerships (UIP), scholars, defined here as faculty and graduate students, are significant stakeholders in UIP's. Their "perspectives" on the collaboration level and the rules they must abide by are key to understanding the impacts related to the partnership (Welsh et al., 2008).

In 2009 UNESCO addressed in its "Trends in global higher education: Tracking an academic revolution" report the main trends that higher education are facing now and for the future (Altbach et al., 2009). The report argues that the transformations which higher education is going through are as dramatic as the ones in the 19th century when the research university evolved in Germany and redefined the university model worldwide. The difference from then to now lays on the scope and number of institutions and people it affects (Altbach et al., 2009). Not different from other activities, higher education has been profoundly affected by globalization, here defined as, "the reality shaped by an increasingly integrated world economy, new Information and Communications Technology (ICT), the emergence of an international knowledge network, the role of the English language, and other forces beyond the control of academic institutions" (Altbach et al., 2009, p. iv). Under the definition, globalization has rendered English as the dominant scientific language worldwide, communication and knowledge sharing have been boosted and simplified by ICT's, while the changes have also helped to concentrate publications, data bases, and other important resources in the hands of the strongest universities and multinational companies, mostly within the developed countries (Altbach et al., 2009). For some, globalization represents a great opportunity to access study and research with unlimited boundaries, while others feel that their culture and autonomy are threatened. Independent of the belief, higher education is increasingly viewed as a major engine of economic development and government taxes are not keeping up with the rising costs of their institutions (Altbach et al., 2009). A series of contextual factors shaped higher education since the 1990's and still influence prospects for the near future (Altbach et al., 2009).

The massification phenomena: There are over 150 million higher education students enrolled globally, an increase of about 53% between 2000 to 2007, mostly in the upper middle- and upper-income countries (Altbach et al., 2009). There has been an increase in low income countries also, with more modest numbers. This expansion is a result of the shift from an industrial economy to a knowledge economy and the rise of service industries (Altbach et al., 2009). The US was the first country to achieve mass education, with approximately 40% of the age cohort, attending post-secondary education in the 1960's. This phenomenon has continuously increased its influence and permeates the remaining trends today (Altbach et al., 2009).

Inequalities in access: To attend a bigger demand and provide education to all sectors means to confront inequalities deeply rooted in the history of countries and regions. In some countries the access to study in general is determined by cultural aspects such as gender and castes and in many countries geographic location can be a disadvantage with communities in rural areas and indigenous groups having below average participation. The most relevant aspect though is wealth. Despite many initiatives for inclusiveness into post-secondary education, the privileged classes have retained their relative advantage in many regions. Cost still is the critical barrier, even in countries where university is tuition free, indirect costs in some cases are a forbidding element (Altbach et al., 2009). In the US, participation rates for minorities still lag behind, due mostly to the socioeconomic condition of the families, regardless of race or ethnicity (Altbach et al., 2009). Bias, discrimination, and disadvantage are not a particularity of Universities, still they are obliged to address these and other challenges in today's diverse societies (Gupta, 2006; Altbach et al., 2009).

Student mobility: In 2009 more than 2.5 million students were studying abroad, and the estimates predict that approximately 7 million international students will be studying outside their home countries in 2020. This is a reflection of national and higher education institutions' strategies to attract nonresident students and the individual decisions of students worldwide seeking better education (Altbach et al., 2009). HEI's are using different approaches such as establishing partnerships with academic organizations abroad, offering degrees and other training programs, development of research programs, branch campuses and others. Even non-English speaking countries have opened degrees in English to attract foreign students (Altbach et al., 2009). According to UNESCO, there are two main trends in student mobility a) Students from Asia entering the major academic systems in North America, western Europe and Australia; b) Countries like UK, Canada and Australia have adjusted their Visa requirements to facilitate foreign students seeking their institutions.

Teaching, learning and curricula: According to a UNESCO 2009 study, information is scarce when evaluating the levels of completion for all population groups, even though it is clear than an increasingly diverse student body puts pressure on HEI's to adapt with new academic support systems and innovative approaches to pedagogy. The study also highlights that more institutions around the world are teaching less of the basic disciplines and offering more professional programs to a much wider range of students today (Altbach et al., 2009).

Quality assurance, accountability and qualification frameworks: The present global environment is more complex and an interdependent world, which demands professionals with a new set of skills, broader knowledge base and a range of competencies to be successful. This has made quality assurance in higher

education a top priority in many countries, to attract new paying students. On the other hand, globalization and increased student mobility are pushing for internationally recognized standards and the significant growth of both traditional institutions and new entrants makes a standardization even more difficult. Today HEI's are mostly evaluated against their own missions, relying on peers instead of government authorities. The increasing number of new institutions makes it harder to distinguish between legitimate institutions from "diploma" or "degree mills" (Altbach et al., 2009). Naturally, consumers of education are demanding some kind of certification or validation to compare institutions (Altbach et al., 2009). A growing interest has been in learning of the outcomes of higher education, such as: interaction between student and faculty; career expectations; completion and success in finding a job. (OECD, 2008).

The private revolution: Today approximately 30% of global higher education enrollment is in private institutions, many of them are pro-profit or quasi pro-profit and these represent the fastest growing sector worldwide (Altbach et al., 2009). The levels of enrollment vary depending on the region, with the highest in eastern Asia with 70%, about 50% in major countries of Latin America and the proportion is expanding in eastern European countries, Africa, India and China (Altbach et al., 2009). According to UNESCO, the most striking example of stability in market share has been the US, with a range from 20 to 25 percent for decades (compared to roughly 50 percent enrollment in the half of the last century). Despite the lower than global average share, private higher education in the US is the most important in the world, with the largest private enrollment, significantly higher than other countries also "in its graduate enrollment, research activity, and finances" (Altbach et al., 2009, p. 82). It is important to highlight the presence of US universities dotting the landscape in Egypt, Jordan, Lebanon and other places.

Even though there are high quality private HEI's, the sector is characterized as demand absorbing, taking in students that might not qualify for the public institutions or in cases when there's less seats than candidates in the public institutions. A related trend is the privatization of public universities where the government is requesting more from these institutions to raise their own resources, especially in counties such as China and Australia (Altbach et al., 2009).

The academic profession: massification has played a particularly significant role for faculty as the growing number of students has caused the average qualification to decline in many countries. UNESCO study considers that possibly about half of the total teachers working in HEI's in the world only have a bachelor's degree, especially in developing countries (Altbach et al., 2009). Also, the use of part time faculty professionals has increased in many countries in the world and professors from state universities are taking part time positions in the private institutions by "moonlighting" (Altbach et al., 2009). According to Altbach et al., (2009).There are a few consequences of these factors:

- Due to the variation of salaries among countries, there is a brain migration to countries that pay more, mostly in a south-north movement. This brain drain has been partially compensated as the outgone professionals tend to develop stronger collaboration with colleagues from their home countries;
- the academic labor market has increasingly globalized, with professionals crossing borders to occupy positions at all levels. The US, in particular, has benefited with the influx of professionals from many different countries, including Europe.
- the professoriate class has lost much of its authority in regard to the paths their institutions are taking to the managers and bureaucrats;
- Graduate programs expansion has become a top priority globally, but its realization has been slow as the demand for undergraduates is very large.

Information and communication technologies (ICT's): A few definitions are important to identify terms used to discuss the topic. For this project it is assumed the following: Distance education is any activity that involves learning without students being assembled in a same exact location, with an instructor (professor) present (Mail, internet, TV, others) (Altbach et al., 2009; Moore et al., 2011). This differentiates from distance learning, which according to Moore et al., (2011) relates to the ability to learn while in a different location from the source of the information; With the growing accessibility to the internet, a new term was introduced, online learning which, despite different definitions, is considered here as an improvement from distance learning (Moore et al., 2011); E-learning relates to any electronic means used (TV, cd-rom, radio, DVD, mobile phone, website, etc) for teaching, with the student being either present or in another location.

According to UNESCO's 2009 study, there is an expectation that the traditional university will become obsolete due to expansion in use of information technologies, distance education and other innovations even though this is not expected to happen anytime soon (Altbach et al., 2009). Perhaps this statement from UNESCO, relates to erroneous assumptions made during the ICT's boom in the 1990's (Altbach et al., 2009, p. 128):

- time and space were globally problematic in higher education;
- that "the desire to broaden access was essentially universal";
- that "the advantages of the new technologies coming out were self-evident";
- that "there was no significant difference between accessing information and constructing knowledge in higher education";
- that "contemporary students of traditional university age were naturally inclined to like and respond well as learners to emerging ICT";
- that "the purveyors of the new technologies could not fail to achieve economies of scale and make profits on their innovative products and services".

Even though distance education has been increasingly improving and has already made significant positive impacts for research and education, especially in the wealthiest countries, reality has

shown to be much more complex than initially assumed (Altbach et al., 2009). There are a few trends presenting challenges and opportunities for distance education:

1) One of the most significant challenges relates to quality assurance. As the acceptance of this form of education grows in higher education, it also enables the emergence of questionable providers. Also, with the massification of demand, many providers invest in operating across borders. These institutions are often not accountable to local jurisdictions in foreign countries and neither their countries' laws have the scope to regulate their activities abroad. Related to these facts is the emergence of more accreditation institutions, which add up to the plethora of options and confusion.

2) Access to ICT's and the internet vary significantly around the globe and it is an important indicator of the deep differences between the "haves" and "have nots". These differences can be expressed by access to phone, internet, power supply and their reliability (Altbach et al., 2009). This disparity can also be seen within the same country. As an example, the majority of distance students are concentrated in urban areas where better options of access exist in comparison to rural and isolated regions. These problems can be compounded by the shortage of technical expertise and/or resources for investment and maintenance. As distance education increasingly relies more on the internet band width, virus attacks, hacking and phishing become a new frontier of relevant challenges to be dealt with (Altbach et al., 2009). Countries and regions with limited access to the global network are lagging behind already and the gap will only get wider if there is no proper structure in place.

3) As English grew as the prevailing language for business, diplomacy, research and education it became an important differentiator especially in terms of the international dimension. The breakdown of long-standing pattern of higher education delivery driven by colonial language ties has been boosted by high-tech ICT's (Altbach et al., 2009). Countries such as the US, United Kingdom, Australia and Canada are already in a better position to operate in the distance education arena.

4) Distance education mostly has been developed to operate in an economy of scale, with curricula and programs design standardized. Most courses are developed and offered by providers situated in the developed countries in the northern hemisphere. Curricula, program design, methodological approaches and content are influenced in this process, leaving end-users, with growing numbers in developing countries with little choice but to adopt the educational products. This renders these products inadequate to address local needs, interests or values (Altbach et al., 2009).

5) Distance education has taken a foothold, especially in those systems that have struggled to meet high demands for access to higher education. This also encompasses many developing countries where there are not enough traditional education providers. In light of the knowledge driven global economy, alternative approaches are extremely attractive and, in some cases, the only viable option (Altbach et al., 2009, p. 132).

6) It is important to highlight that distance education has been growing also within smaller nations for two contrasting reasons. First despite wealth not being a contingency, there are countries where it is not cost effective to develop traditional HEI's, in the face of the continuous demand to upgrade facilities and technology. Second there are small countries which have been investing to become a "knowledge hub" building their capacity based on distance learning as a strategic initiative (Altbach et al., 2009).

7) In today's fast paced global information society and the ephemeral nature of knowledge means that many developments in key sectors such as economics, finance, the sciences and technology, is constant, extremely fast with a short life span of innovative products (Altbach et al., 2009).
8) Major changes are taking place and the technology transformation is one of the key elements to impact higher education systems in the 21st century (Altbach et al., 2009). Technologies such as the internet revolutionized communication and consequentially knowledge exchange has expanded exponentially. Open education has picked up significant momentum providing free access to students, in places where it is not available locally (Altbach et al., 2009).
9) One of the strongest arguments towards distance education is its ability to accommodate the needs of a wide variety of learners. By allowing different kinds of students access to education remotely, this "provides great flexibility and versatility that can attract a huge range of individuals who might otherwise be unable to physically attend classes. These are represented by fully employed individuals, those located far from educational centers, women who are attempting to balance family and school commitments, older students and even the incarcerated" (Altbach et al., 2009).
10) Distance education has been the natural solution to address the massification of students, offering different types of degrees, curriculums, modes of delivery and pedagogical innovations. Even though it is very difficult to determine the number of students enrolled on e-learning, the existence of 24 huge universities at the time of the study, with over a million students enrolled, demonstrates the significance of the technology (Altbach et al., 2009). "ICT's have made learning possible virtually anytime and anywhere, taking flexibility in higher education program delivery to the highest level" (Altbach et al., 2009).

Research Environment: Research universities are considered the pinnacle of the academic system, directly involved in the global knowledge network. These institutions carry a high expectation as engines of economic development but require major investments to establish and are very expensive to maintain. In many cases this generates tension between the three core missions of these institutions: teaching, research and public service. Government support has increased to research-based institutions, especially for areas such as biotechnology and information sciences. Even though the shift from full funding from government to a competition award-based system is growing and contributed to the emergence of the modern research university (Etzkowitz et al., 2000). Research also has benefited from ICT's as through email and social networks, collaboration and joint research were boosted while electronic journals became widespread. Another important change is the existence of the triple-helix of University/Government/Industry relation, bringing a fresh source of resources into the system (Etzkowitz et al., 2000). These changes have generated further differentiation among institutions, such as research only, teaching only and both. These aspects will be further explored ahead.

Financing higher education and the public good-private debate: Universities are institutions that play a key role in education and research for contemporary societies. As knowledge became more important, a

"third role" for research organizations became relevant (Perkmann et al., 2013). From the 1980's, in many different countries, partnerships between industries and universities strengthened. In the US these partnerships were boosted by the implementation of regulation focused on promoting University-industry collaborations, with the Bayh-Dole Act of 1980, executive orders and court decisions facilitating patenting of federally funded research (Welsh et al., 2008; Perkmann et al., 2013). Since then several studies have been developed to evaluate and characterize these partnerships (Etzkowitz et al, 2000, Fontana et al., 2006, Perkmann et al., 2013, Callaert et al., 2015, Andrade et al., 2016). The partnership can boost research output in different ways: First, due to an increase in research agendas and new insights through collaboration with the industry and second due to more availability of funds for equipment and graduate students (Etzkowitz et al., 2000, Fontana et al., 2006, Banal-Estanol et al., 2015). As a counterpart, knowledge is essential for innovation, universities as centers of knowledge and extension play a key role in industrial innovation and as a human capital development (Etzkowitz et al, 2000; Welsh et al, 2008; Banal-Estanol et al., 2015).

Other studies have also highlighted the apparent contradiction of the University's role as a public service to society and as a technology provider for industry (Welsh et al., 2008, Perkmann et al, 2013, Banal-Estañol et al., 2015). In the "information economy" companies seek to add value to the production process through technology and research centers. This also promoted a shift away from standard nationalist centered models of development with a decrease in available funds for research from government agencies, particularly for biotechnology-based industries. (Welsh et al, 2008, Perkmann et al, 2013, Banal-Estanol et al., 2015). Welsh et al. (2008), Banal-Estanol et al. (2013) and Callaert et al. (2015), also highlight in their studies that collaboration with industry can diminish the exchange of information between scholars, due to impeding contract clauses from industrial partners or internal intellectual property regulations from their own research institutions. The biggest concern from the critics of these partnerships is that university administrations today are committed to raise funds from the industry to complement their budget, with a risk of undermining the public objectives that universities have while emphasizing the revenue stream.

According to Hackett (2001), society has two expectations from the academy: that these institutions should perform their traditional public oriented role and should also attend demands from the economic sectors. Welsh et al., in 2008, found that scholars identify the positive results from the university/industry partnerships, especially where there are strong policies enforced against conflict of interests and that the institutions have clear ownership over important discoveries (Etzkowitz et al., 2000; Welsh et al., 2008; Freitas et al., 2013). It is fair to consider that these findings are still true at the present and tends to continue for the future.

Future trends: The pace of change in the modern world seems to be accelerating presenting higher education a more complex environment with each passing decade (Altbach et al., 2009). Shifting demographics, technological breakthroughs and the volatility of the world's political and economic environment, make unlikely that patterns of the past will easily or reliably predict the future (Altbach et al., 2009).

Looking forward, the population structure, its patterns and geographical scope will continue to change globally and will continue as a driving force for development and reform in the coming decades (Altbach et al., 2009). In 2008, the OECD presented in the "Higher Education to 2030" document several key demographic trends for the period of 2030, relevant to students, teachers and society (OECD. 2008, p. 13 - 14; Altbach et al., 2009). Some of the trends were included into UNESCO's study (Altbach et al., 2009) as follows:

- "student participation will continue to expand, as will higher education systems. Only a few countries will see a contraction in student numbers" (Altbach et al., 2009);
- "women will form the majority in student populations in most developed countries and will substantially expand their participation everywhere" (Altbach et al., 2009);
- "the mix of the student population will grow among non-traditional populations, with greater numbers of international students, older students, part-time students, and other types" (Altbach et al., 2009);
- "the social base in higher education will continue to broaden, along with uncertainty about how this will affect inequalities of educational opportunities between social groups" (Altbach et al., 2009);
- "attitudes and policies relating to access as well as the consciousness among disadvantaged groups will change and become more central to national debates" (Altbach et al., 2009);
- "the academic profession will become more internationally oriented and mobile but will still be structured in accordance with national circumstances" (Altbach et al., 2009);
- "the activities and roles of the academic profession will be more diversified and specialized and subject to varied employment contracts" (Altbach et al., 2009);
- "for many developing countries, the need for ever-expanding numbers of university teachers will mean that overall qualifications, now rather low, may not improve much, and current reliance on part-time staff in many countries may continue" (Altbach et al., 2009).

Altbach et al. (2009) complements the trends presented, stating the following:

- Most of the growth will be in developing countries, especially in China and India.

- While gender exclusion has been eliminated in many countries and will continue to diminish, inequality access will continue to be an issue for lower socioeconomic classes, ethnic and religious minorities and rural populations.
- "Institutions will be measured by their success at supporting students through to completion, not by simply getting more students through the door" (Altbach et al. 2009). "This new perspective implies changes not only in how academic institutions measure success but will undoubtedly affect reputations and budgetary allocations" (Altbach et al. 2009).
- Increasingly HEI's "will be more accountable by what and how students learn" (Altbach et al. 2009), fostering difficult questions on how to measure it.
- Diversification of students will promote the diversification of academic institutions serving different needs and constituencies. The private sector will play an important role in coping with this situation as the public universities will not be able to keep pace with student demand.
- Countries "will be challenged to balance local needs and priorities with standards, practices, and expectations articulated at the international level requiring answers for questions such as: Will research focus on local needs or be more inclined to pursue issues more attractive to international journals and funders? How will countries ensure that foreign providers and partners will address local educational needs and priorities?" (Altbach et al. 2009).

The authors of the UNESCO 2009 document highlight that despite many of the trends presented not being new, they understand that now society is being confronted by the implication of these trends that were not recognized when they started (Altbach et al., 2009). It is fair to assume that ways to help assess future uncertainties is a good approach for the future of higher education as well.

5.1.2. The academy - US trends

In the US, since the 1980's, there has been a constant increase in tuition at private HEI's, at an average of 3.5% per year above the rate of inflation (Ehrenberg, 2012). For public institutions, the respective increases in tuition for four year and two-year schools, were 5.1% and 3.5%. At this period, the increase in the private sector has been associated with real expenditures per student, while for public institutions, at best it has helped to compensate for losses from government support (Ehrenberg, 2012). According to Ehrenberg, (2012, p. 3-4), the context of the increases includes:

- "The aspirations of academic institutions, similar to other nonprofit institutions, to be the very best they can in every dimension of their activity which calls for ever increasing resources" (Ehrenberg, 2012);
- The perceptions by educational consumers (students and parents) that the college to attend is as important as the decision to go to college and the belief that "higher priced selective private institutions confer unique educational and economic advantages on their students" (Ehrenberg, 2012). "This leads to long lines of applicants, conferring limited market forces to limit tuition

increases. Their behavior provides a "cover" for less selective private institutions to raise their tuition levels" (Ehrenberg, 2012);

- "The belief that the essence of a high-quality undergraduate education is small class sizes and substantial personal interaction between faculty and undergraduate students" (Ehrenberg, 2012); this has made it difficult to achieve productivity gains and cost reductions;
- "Published rankings, which are based partially on institutions' expenditures per student. This leads to an arms race of spending, as any institution that unilaterally held its expenditures down, or whose expenditures grew at a slower rate than its competitors, would fall in the rankings" (Ehrenberg, 2012);
- "The growth of technology which often comes at a high cost and leads to improvements in quality in higher education, but these quality changes are not reflected in the rate of increase in tuition because, unlike with the CPI, adjustments are not made for product quality changes in computing the rate of tuition increase" (Ehrenberg, 2012).

Tuition revenues: Tuition has constantly increased in real terms as an answer to the trends affecting HEI's around the world, with profound consequences. For example the increase in costs to study make it more challenging for new students ingress HEI's, and economic crisis such as the 2008 global financial collapse only deepens the challenges. From the revenue accumulated due to the increased tuition, the amount going to student aid increased to achieve desired enrollment levels. Even the wealthiest and more selective private institutions were pressured to increase spending on financial aid, in response to evidence that a relatively small fraction of their students came from lower and lower-middle class income families. Also, competition from lower priced institutions and stagnation of family income in the first decade of the century, demanded a response in the form of grant aid and tuition discounts. Student aid increase also became more important to support persistence and graduation levels, contributing to the perceived quality of the institution (Ehrenberg, 2012). The combination with factors such as massification and student mobility, made it even more relevant to attract foreign students as full-priced-tuition payers (Altbach et al., 2009).

Cost based strategies: HEI's are avidly seeking ways to reduce their costs and taking significant steps to do so. Hiring external consultants and focusing on management became more relevant. Economy of scale principles are being applied such as centralizing activities (purchasing, library acquisition) and sharing of campus offices (registrar, human resources). Another strategy has been to share academic resources between two or more institutions that are geographically close, holding down costs and improving access to more curriculum. A similar but broader strategy to the above is the sharing of resources between institutions form totally different regions through investments in distance learning. Some new higher education consortiums have their business model based on e-learning, having no more than three or four

faculty members in the respective departments, a good example of a teaching only institution (Altbach et al., 2009; Ehrenberg, 2012).

Public institutions: The vast majority of US students are in public higher education. These institutions face even greater challenges as their main funder is consistently cutting resources causing, for example, an increase in the number of 2-year colleges due to their lower cost (Ehrenberg, 2012). In 2009, 54% of all new students at public institutions were from 2-year colleges. Now in some states, public education systems are working to stimulate the number of students going into the four-year college, including those from the two-year ones (Ehrenberg, 2012). Public universities are also facing pressure from their government to use their resources more efficiently. There are institutions where the accounting method is based on the revenue generated by faculty member, contrasting the person's income to the number of credits taught and research revenues. This method does not consider the quality of what is delivered to the students which can prove to be an advantage to private institutions that worries about the quality of education (Ehrenberg, 2012). Another challenge relates to the high expectation that governments and society have toward public higher education, to provide results that will lead to the development of new technologies that will stimulate new jobs (Ehrenberg, 2012).

Faculty: The nature of faculty positions has been changing in recent decades (Ehrenberg, 2012). The levels of full-time based faculty have declined from approximately 80% in the 1970's to 51.3% in 2007, with fewer PhD's highbred and the full-time faculty with tenure diminished 18.6% in the same period (Ehrenberg, 2012). The distribution of resources within academic institutions has changed, as a result of fewer resources and competition with non-faculty uses such as student services, academic support and institutional support (Ehrenberg, 2012). According to Ehrenberg, (2012, p. 7), some attribute the changes to administrative "bloat" and the declining influence of faculty on decision making within their institutions.

Trends for the future: Ehrenberg (2012) points out trends that will continue to prevail for US higher education as follows:

- "The pressures faced by public and private institutions to expand enrollment, increase graduation rates, and limit cost increases will continue" (Ehrenberg, 2012);
- The decline of full-time tenured and tenure-track faculty will be exacerbated by the pressures faced;
- The ways that students are taught today will have to change, especially for remedial and introductory level classes;

- "Technology must be employed to improve learning outcomes while reducing per student cost" (Ehrenberg, 2012);
- Wealthy private universities and "flagship" public research universities are in their own league, and will have access to the necessary resources to maintain full-time and tenure-track faculty;
- At research universities, the use of full-time, non-tenure-track faculty, will likely continue and increase. This possibly will free up more time of the tenured and tenure-track faculty for research;
- At other academic institutions, for financial reasons, there will less demand for PhD teachers;
- Pressures for accountability will increase through for example, provision of information on student learning outcomes as part of the accreditation process;
- PhD's will become even less attractive to the American student as fewer positions demanding PhD's will exist;
- Transparency, especially regarding university costs will be a growing demand.

US economic growth and prosperity in the mid-20th century, was highly influenced by leading the world in terms of the percentages of the population with college degrees (Altbach et al., 2009; Ehrenberg, 2012) but today other countries have kept up and passed US, with the country ranking at 12th position (Ehrenberg, 2012). Within the US population, people of color and people from relatively low-income families, are the groups growing most rapidly and historically the ones underrepresented in higher education. According to Ehrenberg, "Improving access to higher education and persistence to college graduation for members of these groups and for all Americans is essential for our nation's prosperity in an increasingly international competitive world where economic growth is based on a knowledge-economy" (Ehrenberg, 2012, p. 10).

Comparing the global and US trends, they are similar and complementary, with varying relevance in comparison to other countries and sectors or areas. Still all sectors, including forestry HEI's are subject to these trends.

Despite several studies seeking to characterize trends for forestry and others for education, the focus is centered on the factors of success or failure and most examples cited are problem driven by immediate challenges such as cost reduction, production planning, added value to products, and process improvement. For the US forest sector, a significant amount of literature can be found on a variety of themes: new products, potential markets, impacts of climate change on diverse environments, productivity algorithms, and process improvement. Little work covers these themes together and at this point, no paper has been found which integrates uncertainty, turbulence and ambiguity in strategic planning processes. The biggest exercise was within Europe through the Integral project mentioned in the theoretical background.

A global environment is a complex system, where no trend is completely independent from another and that change is a constant. Together with globalization, climate change and the digital revolution, these forces impact three others: 1) the pace of change is faster; 2) Unpredictability is growing and 3) the world is transitioning from an industry-based economy towards a knowledge based one. These macro trends are highly relevant to all the forces affecting HEI's.

5.2. Graduate student workshops

The student scenario workshop was attended by 5 graduate students in total, with a distribution of two students from Forest Engineering, Resources & Management, two from Wood Science and Engineering and one from Forest Ecosystems & Society. The workshop also included an undergrad student from the college who took notes during the workshop. The workshop was conducted over two days, on February 5th and 6th of 2019, in Richardson Hall at Oregon State University.

The workshop was based on the presentation from PowerPoint, which was used as the main guide throughout the two-day event. My role, as the presenter was to work as a coach for the group and timekeeper, but to avoid participation in the discussions.

Each participant received a folder containing:

- The letter of consent (Annex 2)
- The Shell study case (Annex 3)
- A printed copy of the presentation
- Material for note taking

Day 1

The first activity required from the participants was to read the invitation letter/ letter of consent to reassure that IRB protocols were followed. After a short period, they were asked if they agreed to participate, which all students assented to.

The workshop started with introductions and each student was invited to introduce themselves regarding their name, department, research and the reason why they were interested in attending the workshop. To this question the following arguments were made:

- "Grad Student sympathy" (to help a fellow student finish his project)
- Enjoys scenario planning
- Enjoys looking at trends within the graduate students to see what they think

- Likes to participate in the professional world and development
- Using information to gain perspectives
- Listening to other grad students' ideas

No ranking was attempted, as the reasons were shared by most students highlighted that all wanted to support the success of this project and that one participant had been introduced to scenario planning as part of one of his previous classes. No further clarification was made for any of the responses during the event.

The first part of the workshop related to the first four slides where participants received information regarding: testimonies of how uncertainty in the future is actually affecting businesses, main trends relating to why uncertainty is becoming a relevant factor in strategic planning and the major trends influencing higher education today and for the future. At this point the participants asked questions related to the trends which were most focused on distance education and climate change. Students brought in their own perspectives and a debate about climate change was interesting but didn't relate to higher education. At the end of this part, most of the students' interests were on macro subjects, such as climate change and less to the higher education trends. The presentation moved to the slides from 5 to 8 when participants were introduced to:

- The TUNA concepts (Turbulence, Uncertainty, Novelty and Ambiguity) as the main elements that play a role in future unpredictability;
- Premises necessary to understand in order to seek complementary tools to conventional strategy approaches;
- Scenario planning as one of these complementary tools and the main concepts for it to work.

A few questions were asked, and examples given, regarding the TUNA concepts. Also, I informed that there are other approaches to scenarios and different forecasting tools. The key message was that unpredictability is growing and we would be testing one tool that had shown success, referring also to the study case sent previous to the workshop.

The next step was to present the question to be answered and the core activities to be developed. The importance of the endpoint was highlighted, and the group identified that in 10 years there wouldn't be significant changes and that in 20 years the trends would still be unrolling so 30 years would be an interesting time to explore alternative futures. The year of 2049 was defined as the Endpoint.

Following, the group was introduced to the mechanics of reframing and re-perceiving and an overview of how the process works. The next slide informed how to develop the Strategic landscape and the students were invited to develop the expected scenario strategic landscape for 2049 (Figure 10). This

became the official scenario used as a reference for students to try to avoid repeating in the process of developing an alternative scenario.

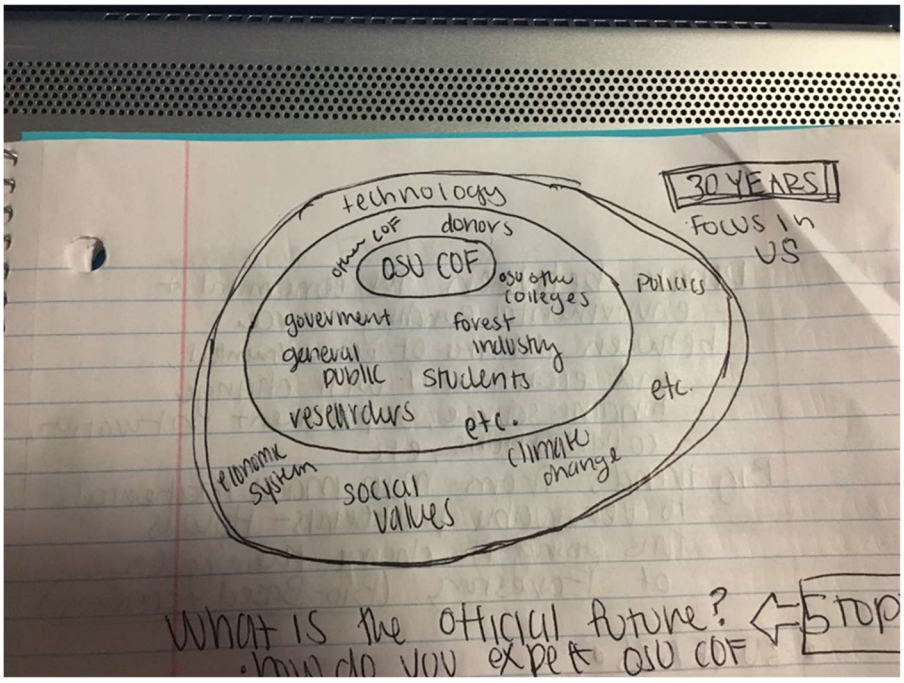


Figure 10: The student official future Strategic landscape

The first step was to identify the client of the study, which was defined as the Oregon State University, College of Forestry (CoF). Next the group developed both the contextual environment and the transactional environment (Table 5).

Table 5: Student Official Future Strategic Landscape Forces and Stakeholders

Contextual environment	Transactional Environment
Technology	OSU other colleges
Economic system	Forest Industry
Social values	Students
Climate change	Researchers
Policies	General public
	Government
	OSU

For the 2049 expected future, participants described the College of Forestry as a worldwide online provider of knowledge, with a bigger graduate school, with more people needing PhD's and master's to succeed. As a consequence the College will have a larger number of students compared to the current context, the College will become one body instead of three departments, much more

collaborative in nature, mostly funded by industry and less from the government and the college will have an environmental and sustainable approach.

With the "official future" established the participants were challenged to develop an alternative future. To this end the participants developed and further explored the contextual environment and clustered the elements according to their similarities (Table 6).

Table 6: Student Cluster of driving forces

Cluster	Environment	Social	Economy	Political	Technological
Forces	Climate change	Demographics	Economical system	Policies	Innovation
	Environmental Values	Social Values	World trade	Political changes	Technology

Next the participants plotted the forces in a graph according to their level of impact and level of uncertainty (Figure 11). With this the group identified the critical driving forces, found on the top right corner of the graph (Table 7). The critical driving forces identified were: Climate change/ Innovation/ Political changes/ Policies/ Environmental values/ Social values.

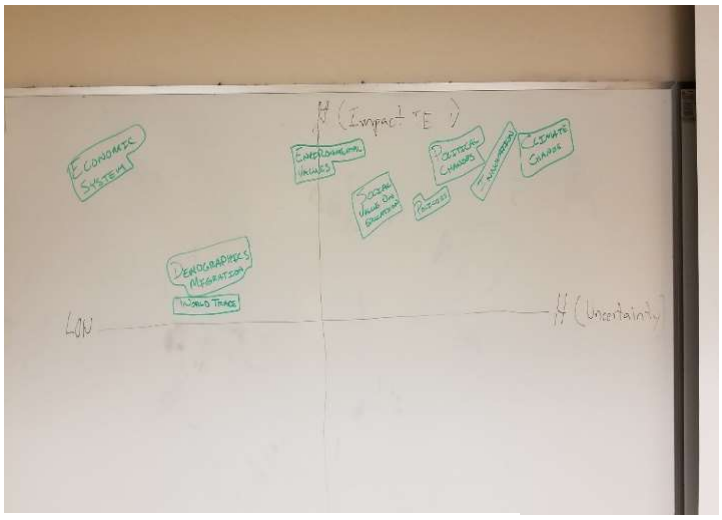


Figure 11: Student Critical driving forces

Table 7: Student Critical driving forces

Critical Driving Forces
Climate change
Innovation
Policies
Political changes

From these forces the students selected the two most critical to be tested as potential axis for the identification of alternative scenarios, Climate Change and Innovation. The next step was to assign the extremes of each axis that makes sense, interacts with the second axis and are independent from each other. The students tested different denominations until they identified the ones that were most feasible to work with (Figure 12):

Day 2

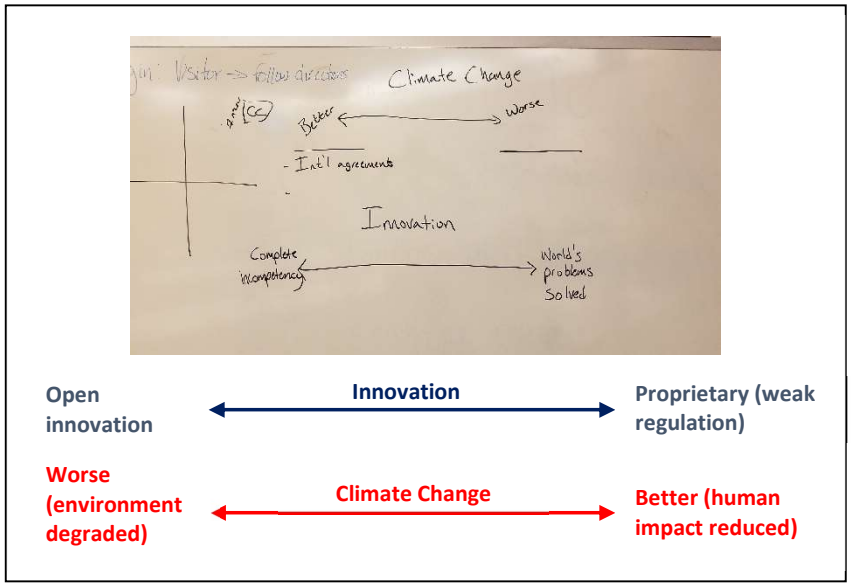


Figure 12: Student Axes definitions

On the second day the participants used the axis defined, combined both of the axes defined and four different scenarios were created (Fig 13). These scenarios were evaluated according to their plausibility of happening and each one received a name that most represented the core concept that it entailed. The scenarios were named as: Brown socialism, Wall-E, Utopia and Green capitalism. The group decided that from the four scenarios, even though more than one was plausible, the Green Capitalism was plausible to happen and most interesting to study.

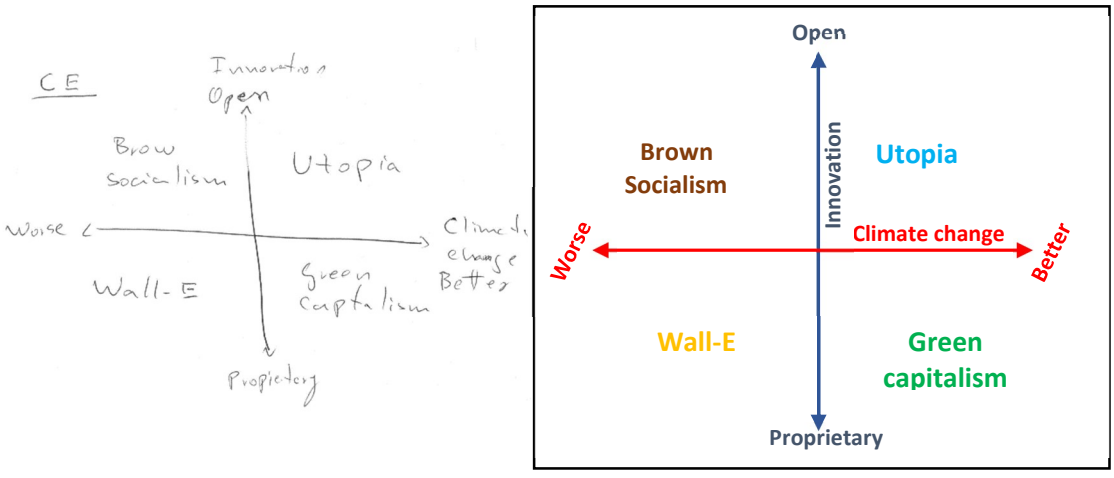


Figure 13: Student Scenarios developed

The last slide of the presentation informed the participants of how to develop a story for the chosen scenario. The students developed the story partially until the end of the workshop. For this reason the notes of all participants were collected and added to the notes taken by myself. The information gathered was used to prepare a draft that was sent to the students for their appreciation and corrections to be consistent with their understanding. After the participants' agreement the final version was developed (Annex 5).

It is important to highlight that the main objective for the thesis was not the scenarios themselves, but how a sample of members from the forest academy perceive the potential of using scenarios as a tool to improve strategic planning processes. It is also worth noting that there are an infinite number of scenarios possible. One lonely scenario is not the goal of such an exercise, rather the development of a greater number of scenarios is desirable for the purpose of supporting a strategic plan. To achieve this, more participants and more time is desirable. That said the scenario developed has some interesting points for discussion.

Day 3

With the students it was possible to meet with most of them for a third time before the interviews. In this opportunity we discussed possibilities of using alternative scenarios. To enhance their experience the students were asked to develop a strategy for the Green Capitalism scenario. To this end the approach was that the college had developed a scenario exercise and among the different scenarios, the Dean tasked this group to develop a strategy to prepare the college for it. The question was: What is the College of Forestry to become in the scenario?

The students revisited the Green Capitalism scenario and defined its strategic landscape (Figure 14; Table 8) and sought out the key forces from the contextual environment and the stakeholders from the transactional environment.

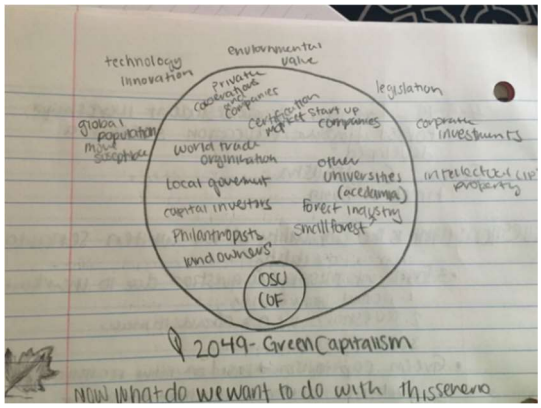


Figure 14: Green capitalism Strategic landscape

Table 8: Green capitalism strategic landscape

Contextual environment	Transactional Environment
Technology Innovation	Philanthropists
Global population sensibility	Landowners
Environmental values	Investors
Legislation	Local government
Corporation Investments	World trade organizations
Intellectual property	Private conservation companies
	Certifiers
	Start ups
	Other universities
	Forest industry

The group defined the CoF as the client and focused on the closest stakeholders of the transaction and all participants agreed that neither OSU or the CoF are currently ready for the challenges and opportunities that Green Capitalism presents. The participants assumed some premises for CoF being successful in this scenario:

- The college needs to be bigger (scope and openness)
- CoF brings innovation
- CoF becomes a beacon and among very few forestry colleges left

To achieve the above OSU needs to:

- Reduce government resource dependence
- Became more of a company rather than an academy (develop its intellectual property competitiveness)
- Collaborate within the college (bring FES, WSE, and FERM closer together in research)

This would bring unity to the CoF to allow ties in different sectors and better use of resources. It would also allow for collaborative research and bring thriving results to the college. A debate rose if the CoF should become a school of forestry rather than a college which the students concluded that it should stay as a college to also keep the diversity of thoughts and projects within it.

To achieve these goals the students identified the need for a creation of a research institution within the college, composed of researchers from the three departments and shared interests. It would be interdisciplinary in its nature and have its own business plan.

The institution would be implemented in two steps: First to establish it within the CoF in a period of two years and second to broaden its scope and become an “Interdisciplinary research institution, that brings outside investors to fund itself and stakeholders from society, government and industry. The OSU CoF becomes a cooperative research institution.

The students highlighted that this institution would work not exclusively with forestry companies but also others interested including sister colleges and/or universities and research institutions. The second phase would have a 5-year deadline to mature. Other ideas were suggested as potential outcomes, such as developing a new major within the college based on innovation for green technology research. New departments could be spawned from collaborative efforts for example from Forestry and Agriculture, such as an agroforestry sustainable development major or department. The key factor is that this institution would evolve and base all its actions on a vision developed to cope with a sustainable and environmentally friendly, world economy (Annex 6).

`5.3. Academia workshops

The Academia scenario workshop was attended by two graduate students and four faculty members, with a distribution of two students and one faculty from Forest Ecosystems and Society and three faculty from Wood Science and Engineering. The workshop also included an undergrad student from the college who took notes during the workshop. The workshop was conducted over two days, on the May 8th and 10th of 2019, in Richardson Hall at Oregon State University.

The workshop was based on the presentation from PowerPoint, which was used as the main guide throughout the two-day event. My role, as the presenter was to work as a coach for the group.

Each participant received a folder containing:

- The letter of consent (Annex 2)
- The Shell study case (Annex 3)
- A printed copy of the presentation
- Material for note taking

Day 1

The first activity required from the participants was to read the invitation letter/ letter of consent to reassure that the IRB protocols were followed. After a short period, they were asked if they agreed to participate, which all assented to.

The workshop started with introductions, and each participant was invited to introduce themselves, regarding their name, department, research and the reason why they were interested in attending the workshop. To this question the following arguments were made:

- "Grad Student sympathy" (to help the student finish his project)
- The sector, especially the business, needs to find better ways to prepare and adapt for the future
- Approaches to education can and should improve
- Focused on education topics
- Had exposure to scenarios previously
- Interest in the tool for future activity

The first part of the workshop related to the first three slides where the participants received information regarding: main trends relating to why uncertainty is becoming a relevant factor in strategic planning and the major trends influencing higher education today and for the future. Differently from the

graduate student's workshop was the absence of the slide providing testimonies of CEO's and strategic planning professionals regarding how uncertainty is affecting their business. This slide had been inserted initially to reinforce the perception of external players in world towards uncertainty. This showed to be not necessary.

At this point the participants were invited to develop the "Social context of time" exercise. The first two questions were answered directly by the group and the consensus was that there are infinite number of possible futures and that the future should to be tackled today and not when it happens. For the third question each participant individually developed their own representation of the three spheres (Past/ Present/ Future) and how they relate to each other within their institution. Soon after the participants presented to the others their concepts and the reasoning for it. The exercise rendered interesting insights into how much weight the past and future have in preparing for the future ahead. I used their conclusions to present the concept that to deal with "the future" you need to devote more attention to it and not only to past experiences. The presentation moved to the slides from 5 to 8 when participants were introduced to:

- The TUNA concepts (Turbulence, Uncertainty, Novelty and Ambiguity) as the main elements that play a role in future unpredictability;
- Scenario planning and its premises;
- The objective of the exercise and its steps.

A few questions were asked, and examples given, regarding the TUNA concepts. Also, I informed that there are other approaches to scenarios and different forecasting tools. The key message was that unpredictability is growing and we would be testing one tool that had shown success, referring also to the study case sent previously to the workshop. The group was introduced to the mechanics of reframing and reperceiving and an overview of how the process works.

After the question for the workshop was presented the exercise started with the presentation of the Strategic Landscape concept. The participants first defined their endpoint as 2039, 20 years from now. After the group considered short term and longer terms to which they ended agreeing that: 1) Much lesser than twenty years the trends would still be unrolling and that too much further would be difficult to develop and that changes were needed sooner than later. With the endpoint defined, the participants developed the contextual and transactional environments of the Strategic Landscape for the expected future or the "Official future" (Table 9; Figure 15). The client of the study was defined as Oregon State University (OSU).

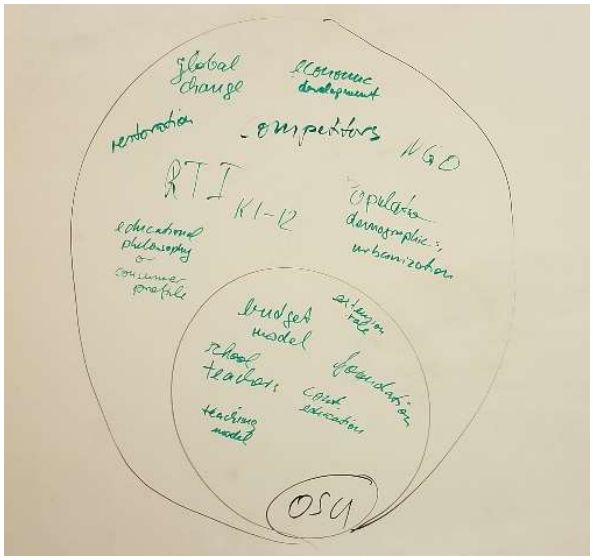


Figure 15: Official future strategic landscape

Table 09: Official future Strategic landscape

Contextual environment	Transactional Environment
Educational philosophy	Teaching model (different)
Global change	School teachers
Economic development	Continuous education
Return of Investment (RTI)	Extension (modernized)
Demography	Foundations
NGO's	Budget model
Society values (Restoration economy)	
Competitors	
Urbanization	

For the 2039 expected future, participants described that OSU would still be recognized as a leading university in forestry, online courses would have grown in number of students and courses offered, with increased relevance to income. Graduate enrollment, would be bigger, but fewer students campus-based. The education model is expected to become more flexible but still prescribed. The University-Industry Partnership will be more prevalent with lesser participation from government funds. Environmental challenges and sustainable approaches will continue to exert influence as forces such as global change and society's value push towards cleaner technologies.

With the "official future" established the participants were challenged to develop an alternative future. To this end the participants developed and further explored the contextual environment (Table 10; Figure 16). The group understood that no clustering was necessary.

Next the participants plotted the forces in a graph according to their level of impact and level of uncertainty (Figure 16). With this the group identified the critical driving forces, found on the top right corner of the graph (Table 10).

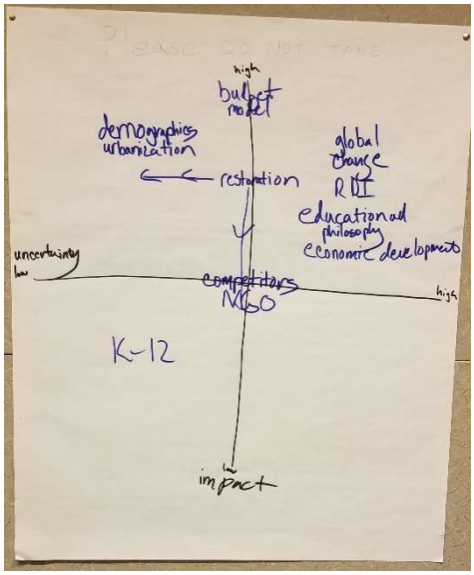
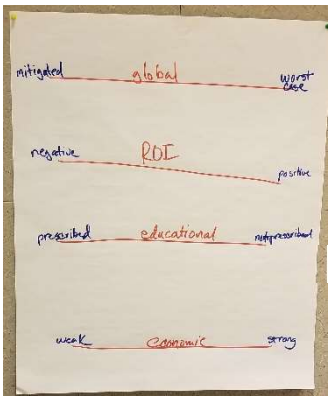


Figure 16: Critical driving forces

Table 10: Critical driving forces

Critical Driving Forces
Climate change (Global change)
Return of Investment
Education philosophy
Economic development (Forestry)

For these forces, the participants assigned the extremes of each axis that made sense, interacts with the second axis and were independent from each other. The participants tested different denominations until they identified those that were most feasible to work with (Figure 17).



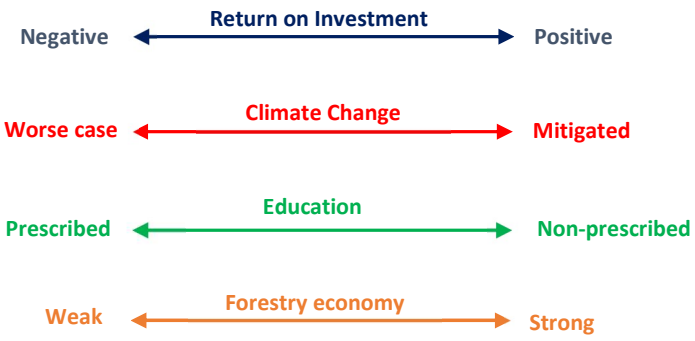


Figure 17: Axes definitions

The participants used the axes defined, combining them two by two, and four different scenarios were created for each combination (Figure 18a and 18b). At this point sixteen potential scenarios were available for further study and I intervened suggesting to start studying each one for their plausibility of happening, the relevance to the client's question and how different they were from the "official future" and among themselves. Each one received a name that most represented the core concept that it entailed.

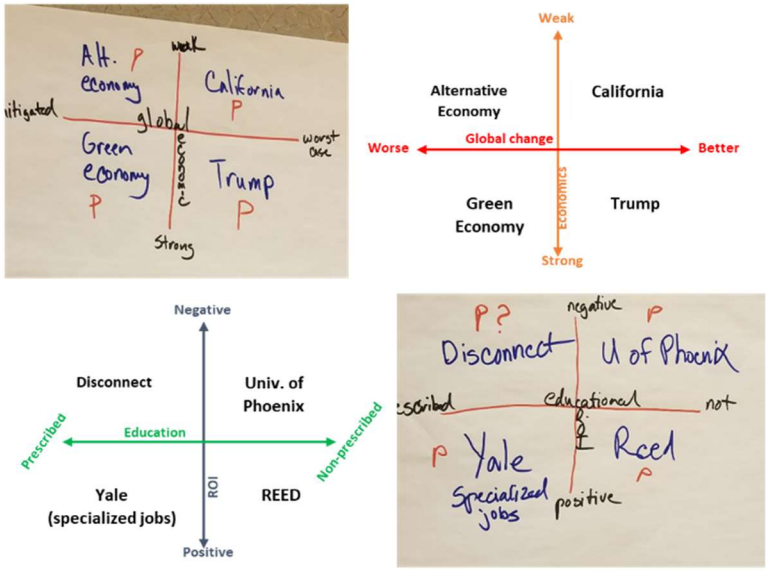


Figure 18a: Scenarios developed by the academia

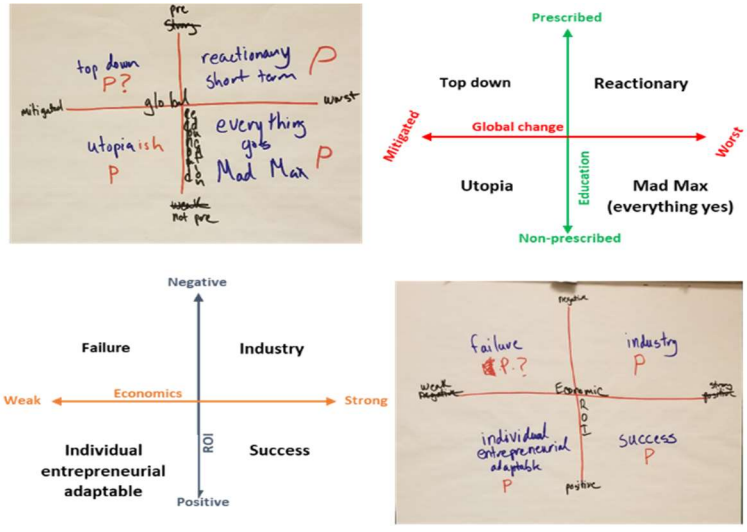


Figure 18b: Scenarios developed by the academia

Day 2

The second day started with a short discussion about a YouTube video sent by one of the participants which was a good example of a scenario developed and transformed into a video. Following the group revised their scenarios and chose the "Green Economy" scenario (Annex 7) and the "Reed" scenario (Annex 8) to study further (Figure 18a). The last slide was presented on how to develop a story for the chosen scenarios.

5.4. Interviews

In phase 3 the participants were interviewed individually. The questionnaire was the same for all participants, recorded and transcribed for the analysis. No participants had access to answers from their piers and were free to express their perceptions at will. The information was analyzed as described in the methods.

5.4.1. Themes

After reducing and coding the information for each participant and for each question the results were analyzed by question as the individual participant profile was not the goal. The analysis within one interview had the goal to identify cross information that could help support or add to another question and not to study or analyze the respondent profile.

The answers were analyzed in a different order than how they were made. They are grouped into a logical sequence of layers, to facilitate for the reader to follow (Annex 9). In the interview protocol the questions were listed in a different order with the intent to avoid driving the thought process of the respondent.

The results were compared looking for similar themes that could encompass the major perceptions from the exercise. Five themes were identified along with a series of sub-themes.

It is important to highlight that the classification in themes have the purpose to organize the ideas for presentation, but they are not at all excluding boundaries.

Even though already discussed in the theoretical background, the definitions of TUNA are presented here again as it is important for understanding the discussion.

T – Turbulence

U – Uncertainty

N – Novelty

A - Ambiguity

The major themes identified were as follow:

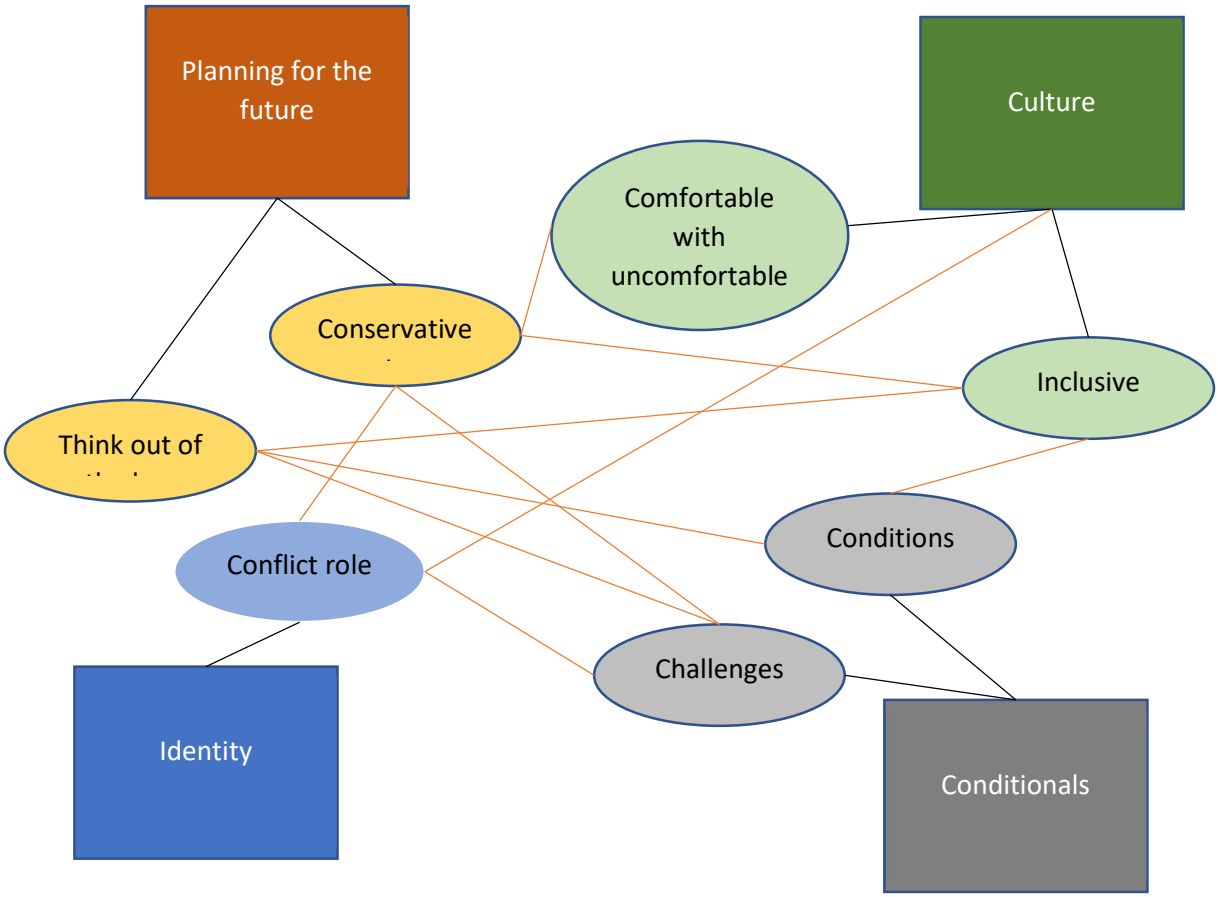


Figure 19: Themes and sub-themes

5.4.1.1. Planning for the future

The Planning theme considers all sub-themes that were identified as impactful to strategic planning, how it is developed for a higher education institution and for other related stakeholders and the potential impact that TUNA and scenarios could have for planning for the future.

Participants were very clear in the responses regarding how conservative the forest sector is as a whole. This perception was identified in the replies to questions that explored: a) if scenarios would be useful for the strategic planning of HEI's, b) for other related stakeholders

and c) questions that asked what the main challenges for scenario's adoption were. This also was present in question eight, which explored if these tools could affect the support that academia could offer to other stakeholders. Interestingly, this perception showed up at the first question, which explored how scenarios had impacted the participants at a personal level and could be indicative of how worrying the conservative nature of the sector can be for professionals in academia. This factor was coded as the sub-theme Business as Usual (BAU). Within BAU, the two major concepts identified in the study were the reactive nature of the forestry HEI's and its comfort zone.

Reactive nature relates to the approach of HEI to develop most of its actions upon reacting to a problem, demand or regulation, and less in taking the initiative of investing on trends for the future.

Comfort zone relates to the resistance to ask hard questions or think differently from the standard, choosing to accommodate a wishful future that is sufficiently stable and predictable.

> *"Well, I think that the forestry higher education should be more intentional about the way that they're thinking about the future versus just reacting, I guess, to current forces on past forces. So I think creating a space for more of this kind of visioning of scenario planning could really be useful for the field."*

> *"I think if I reflect back on any kind of strategic planning I've been involved with in the past, It's been at least narrowly focused on strengths, weaknesses, opportunities, threats, and then, moving forward with that without stopping to think exactly where you're going? How you're going to respond to an external environment, that's a much bigger influence than just your small entity, right? The engineer in me wanted to say, well, this isn't really feasible. So why talk about it? On the other hand, I don't know what's feasible, I mean, I, this isn't really going to happen. How do you know that? And the moment you've decided, you're pretty sure it's not realistic. If you put too many boundaries on yourself. You may be surprised."*

The participants identified that scenarios could help to improve strategic planning for HEI as it promoted a series of elements that can contribute to planning for the future. From these, the predominant sentence throughout the study was that scenarios promoted "think out of the box" which was identified as strongly related to the premises of the tool of Reframe and Re-perceive. Also important was the perception that the tool helped to incorporate uncertainty into the thinking process of a plan, which permits to integrate a wider future for strategic planning, in a safe zone, where the institution is not under an immediate threat or crisis. Other benefits

identified were that this approach can spill into the institution by building new skills, help to develop a more proactive approach, making the institution more adaptable and evolve its role into the future.

> *"Yeah. I think it's an important part. It's it is part of the realm of strategic planning. I think, is just getting people to think outside of the box, but also getting people to get comfortable with change. I think it's also important because people can become resistant to change and so if your you're using scenario planning as a "What if" tool where there's a essentially low stakes early in the process. So if you get them used to that, I think that they'll be more comfortable in making bigger and more informed decisions when it, where it really counts, you know outside of the scenario planning environment."*

> *"Yes, just because you can make different assumptions I guess or situations and address them and for them without actually being in a problem, right, so your preparing potential solutions for any problems that might arise or others that can arise in the near future."*

> *"I think if they want to move away from being reactive and to truly be thought as leaders in these spaces, then they have to start doing this, otherwise they'll be, "as it is". It seems now as a student, industry comes to academia and says, "hey, we need these things" and they haven't even, very well, we don't even know if really these are the things that they need"*

Even though potential use of the scenarios were pointed out in the answers above, building bridges between the desired and the possible was highlighted. This deserved my attention as it seems to relate to the exercise of preparing an expected future during the workshop, which was not planned initially.

> *"I think with strategic planning, you have these, "this is what we want to happen". And it's valuable from, this is what we want to happen, but this is what might actually happen. So how do we respond and maybe bridge between, you know, what we hope to happen and what we expect to happen versus what could potentially happen.".*

A very interesting group of answers, coded as Next GEN, relates to the concept that a path to integrate TUNA elements into strategic planning processes, potentially for the whole forestry sector, is preparing the next generation of professionals with these concepts added to their experiences while in the university. It is fair to say that this is probably the most concrete way to improve the planning processes of HEI in forestry and its related stakeholders.

> *"(University comfortable with change) certainly would spill over to students that they would come out of this and become employees that have that on their mindset and would spill over, when we deal with agencies, we would see the difference in culture and all that set up directly."*

5.4.1.2. Culture

The Culture theme considers all sub-themes that were associated with the values and approaches that can impact the work environment, within a higher education institution and for other related stakeholders. This theme was strongly related to the benefits scenarios can bring to an institution and the challenges that need to be overcome for success.

Participants were very clear regarding the conservative nature of the forest sector in general, which naturally is intrinsically associated with the culture of its institutions. Throughout the interviews the main characteristics pointed out were the reactive approach to situations, the resistance to experiment with new processes and to explore out of their comfort zone. The comfort zone concept also related to the choice to accommodate a wishful future in the strategic planning, predictable and stable. The previous examples, according to the respondents, are shared by the forestry sector in general. The governance approach of institutions that adopt the tenure track system was one specific aspect related to HEI's. This sub-theme relates to the challenge that administrators can face in determining compulsory participation to faculty, in processes or activities to be attended or adopted, due to the security and relative freedom it confers. This is in line with one of the trends identified in the secondary data assessment.

> *"....* (difficult) *to get people on board with it from the start because the forest industry is pretty resistant to change and they sort of lag behind in technology as well. Those are too big hurdles because that's going to take a lot of collaboration even within a company. .... The implementation would be challenging as well because of resistance to change and the lack of flexibility and ability to react quickly."*

> *" Tenure system has benefits. But it also allows for so much freedom. It's got to be hard for managers to say, this is where we're going, everybody, let's go. And so you can be a very much an independent operator as far as what you do....., those changes are very hard to make, ... If they decided they're going to stay entrenched, keep focusing on the past, regardless of your scenario, that's what they're going to do, probably, and it's hard to make changes at that."*

The answers also pointed out the potential that scenarios have to break with the standard "*modus operandi*" and contribute to the strategic thinking process. The answers focused on the ability that scenarios offer to challenge the frames of the ordinary process of thinking, breaking with ingrained habits, permitting people think out of the box in an orderly manner. It was clear in the analysis what the participants saw that could spill into the institution and spill out towards society and other stakeholders. The respondents highlighted that the tool could develop an open-

minded administrative approach, becoming more comfortable with the uncomfortable and more inclusive, including professionals of different areas and levels and also the participation of outsiders to the HEI. The culture of the institution would become more creative, more relevant, while building new skills within the workforce. Possible consequences were present in answers and designated as “Spill outs”. The main ones came from the question that explored if the adoption of scenarios by a HEI, could influence the other stakeholders from the sector. The main points considered that the adoption of the tool could facilitate the inclusion of external stakeholders to participate in discussions on the future of the industry, regulations and needs of society. This could promote improvement of services provided by the HEI and boost the institution’s leadership in the sector by influencing a change in approach that related stakeholders have to strategic planning.

> *“….academic institutions could demonstrate or lead or pave the way as a global leader, for other entities like agencies and industry, to also be thinking this way, like, we're all kind of in this community, together, caring about similar things, about dealing with natural resources. And so I think everybody benefits when there is more creative, flexible forward thinking.”*

> *“to me the added value is really that every participant gets exposed to the notion of uncertainty and in a way that they cannot ignore it. The idea that it's okay or that there’s value to have a different opinion and we don't need to come to a compromise from the start. I think allows people to explore the options that are stronger than in a meeting where you already know that there’s a certain agenda and you’re looking for some compromise that everybody can live.”*

Three of the responses highlighted a need for adoption of tools such as scenarios, in an academic program for students. This Next Gen sub-theme is a path to integrate TUNA elements into strategic planning processes, potentially for the whole forestry sector, by preparing the next generation of professionals with these concepts added to their experiences while in the university. Not only the integration of uncertainty into the strategic thinking phase but it would carry all other concepts presented by the respondents, such as inclusion, diversity and creativity.

> *“Yes, like a 100% Yes. So I think our responsibility as an academic institution is to prepare students for the industries that they would be going into. If we're preparing our students knowing that the future could be any of these variety of scenarios, and we have planned for those, then that then informs industry of what kind of employees they need, a timeline that they might need them in the technology that they might need to be able to use.”*

The challenges of the group activities were also present in the replies. Participants highlighted aspects such as the importance of having a safe environment for all participants to express themselves. Behavioral rules were mentioned twice as was the diversity of backgrounds as key to the success of the workshop. Also bias was cited at institutional level, particularly for NGO's, related to the promotion of one or a few factors in a potential future, attached to an agenda.

> *"For non-profits and NGOs, a challenge might be the desire for a particular future outcome that biases their ability to thoroughly examine alternatives."*

Some of the statements made are not particular to scenarios, they relate to most group discussions for positives and negatives, such as inclusion, diversity and behavioral rules. Still participants highlighted a few particularities of scenarios such as becoming comfortable with the uncomfortable, challenging the personal frames in a safe zone, where participants of different backgrounds and levels of power can contribute without the preeminent risks on the horizon. It is fair to consider that this aspect promotes a more relaxed environment, with more openness to different participants, with more freedom of expression.

5.4.1.3. Identity

The Identity theme relates to the need perceived by the participants, for HEI's to revisit their role within the forestry segment. Three replies identified that this fact was not only important but that scenarios could be a good tool to this end. This perception even though not unique to a scenario environment, was probably enhanced by the discussion of the trends and even more by the realization that different futures exist. The responses were organized in three subthemes:

- Subtheme one, focused on the identity crisis that HEI's are facing, regarding their role within society. Are they a public good, a pot of solutions for the industry, something else? These responses are in agreement with critical trends identified and described in the secondary study for the future of higher education.
- the second subtheme includes the elements that have already surfaced in other themes, that could help HEI's to deal with the identity crisis above. This theme focused on the potential role of HEI's becoming leaders within the forest sector, by being more

participative in planning processes, embracing concepts of an expanded future and evolving into a proactive mindset. Universities could better deal with their internal biases, improve services and be seen as beacon for all stakeholders.

- the third was the preparation of the next generation of professionals in order for them to be able to cope with the changing environment they will face.

"So I think for this to be a useful tool, you kind of have to figure out what your mission is, not just what you have written down how you actually operate. What are the things you're doing now? Is this moral? Are you a service provider? Or are you a public good? Because I think that's where we got some disagreement for how things should be in the future. So I think first you have to figure out, what do you want to be? And then I think then it's a very useful tool for brainstorming its different types of futures and how we might be able to prepare for them."

"I think what I got out of this workshop the most is that there is some disagreement about what university's mission even is. So, it used to be traditionally that we educated for education sake, and this is a public good. And going to university, it has value within itself. And now we've had this shift where universities value is based on the type of career that you get afterwards. I think there's kind of this identity crisis."

"Also because it's always important to think the future we are shaping. What are you teaching to prepare people for the next four or five years to the markets to the future jobs, at least in that small-time frame? It's important. But if we think, like, a broader time frame, it's even more important."

5.4.1.4. Conditionals

The Conditionals theme relates to certain key elements perceived by the participants to be necessary for the success of scenarios and the main challenges for its implementation within a HEI.

Almost all participants stated that one element of ultimate importance was to have an open mind, especially from administrators, to be more open to discuss the future on different terms than normally done. The "open mind" factor relates to the culture of an institution that can facilitate or hinder the adoption of such processes, especially in its preliminary phase. Also it is important to consider that such processes can positively influence the adoption as it can refeed the opening of more minds in using it properly. A second very important sub-theme relates to trust in three forms:

- Trust in the method that it is comprehensible, with a clear understanding of what it can achieve. It has to be gained by the participants and by decision makers. This subtheme relates strongly with the clarity and relevance of the information developed;
- trust that whoever participates can do it in a safe way, with no consequences related to different power levels within a group, in a safe zone;
- trust that there will be continuity to the process, that the investment of time and contributions from participants will not be wasted due to preexisting agenda or low commitment from decision makers.

"I think, for decision making, they would need to be like very clearly defined with similar language, and in a way that is relevant to the decision maker, as well."

"I think that goes hand-in-hand with, they have to sell it to the governor, the legislature, the public, this is a valuable thing to do. So we are learning with more. …. A big part of it is, trust that, people feel comfortable to speak, to make points that are critical and that may be extreme, or at least feel comfortable bringing up fixing viewpoints in."

"It's actually three kinds of trust. Yes, those two and then the trust that the agency or that we see we can implement them, that it doesn't get co-opted by some other interest."

With regard to the challenges, they relate to practical elements that any institution and decision makers will contemplate in the adoption of any process related to their business. The challenges relate to the perception from decision makers of the relevance of adopting scenarios to their planning process and the benefits that it can incur. The majority of respondents had it clear that the greatest challenges for the adoption was in its cost. Cost of time in diverting professionals from their main function to develop scenario exercises and the financial cost of employee and facilitator salaries. Financial benefits would probably be the hardest to identify, or even measure. When would the measurement be taken, how long to wait, what to measure?

"I think their primary challenge is capacity, because it's time consuming, so convincing staff of the institution that it's a worthy use of their time is a challenge."

"I think especially now that universities are going through a really hard time economically speaking, so offering anything or any tool, any workshop, anything, if there is not something that is going to be economically speaking in return to the university and to the college, I think that could be a problem."

5.4.1.5. Positives and Negatives of the tool

Beyond what is included in the four themes, a few other points were made in relation to the mechanics of the tool itself.

Positives

Structure relates to positives that participants perceived of the mechanics of the tool.

"… using the two axes, the way that we did for those different scenarios really spurred people's thinking in ways that maybe they wouldn't have thought if we had just been asked, come up with random things, random features. So I think that that process is effective in it spring new ways of thinking."

"the series of steps that we did, starting with, I guess, thinking about the relationship between the past and the present and the future and thinking about the path to the future that we're currently on, helps set the stage for imagining different possibilities."

Negatives

Structure relates to aspects of the mechanics that were identified by the participants during the workshop. A few sub-themes were identified as follows:

- Complexity of the protocol was identified as a negative aspect, due to the number of steps of the method and the requirement of more people which can add to the complexity due to more ideas and divergence.

- Collaborative exercise relates to challenges that participants perceived due to the collaborative nature the method requires.

> *"The more people you have the better information you're getting but the more it can get complicated and even more time consuming so you have to have some really good group of people and also very good proctor or person administering to keep everybody on track and focus."*
>
> *"As in any type of collaborative environment, (the challenge) its keeping people focused on what you're really trying to accomplish and not letting people wander off. You also have to watch out for things like group thinking and things like that. So, the challenge and the disadvantage is that you're still dealing with people. So, all those dynamics are still going to come into play. You need to be able to*

minimize the impacts of those while, getting people to realize the advantages of scenario planning and try to structure how they think about participating in scenario planning so that they can pull out some of those advantages."

Closely related to the Trust sub-theme is the presence needed and the quality of the facilitator for the success of the exercise.

"I don't really see a whole lot of negatives other than that, you do need somebody facilitating it pretty much the whole time to make sure that it actually rolls forward in an appropriate manner. Without that facilitator, I think we probably would have gotten in the weeds multiple times."

Challenges, these could be identified as other necessary conditions that can pose a challenge to achieving positive results. This theme was defined by a collection of different aspects: bias, buy-in, behavioral rules and diversity of the participants.

- Bias, relates to that people willing to participate are, potentially, more prone to change resulting in the lack of inputs from other important sources.

- Buy in, relates to the need of support from upper management for such an exercise to take place and from other members of an organization to be successful.

"For some people will be, well the people that probably should be really taking advantage of his will be more reluctant to participate and commit to that and I suspect the people that you know, that are excited about it are already thinking in different terms."

"You need to have buy-in from more than the decision-makers, need by in by the implementers down the line and staff. So there is quite a commitment to make from within the whole the outfit."

"the negative would be you've got to have the right people in the room. And you got to have the right, you know, getting people into the right mindset is can be challenging."

5.4.2. Perception chain

Regarding the depth of perception of the participants, except for two different participants, for one question each, the majority of the answers were given properly, using terminology presented and discussed during the workshops.

All but one participant replied that scenario building experience had an impact on how they perceived the future (Annex 9, Answers 1). The concept of reframe and re-perceive, wider future and thinking out of the box were common concepts in the replies.

For layer two, that investigated if scenarios could impact a forestry higher education institution, the respective decision makers and what were the challenges, all responses were positive in stating that it could contribute, within a range from "can contribute" to "all institutions should use". A series of conditions and challenges were expressed which can be seen in the themes above or in Annex 9, answers 02, 03, 05 and 10.

For the third layer, that investigated if there were other potential users for scenarios, within the forestry sector, all respondents were positive in saying that there were, with special emphasis for the industry. The challenges were very similar as the ones pointed out for an HEI, with emphasis on the cost/benefit relation. NGO's received a unique concern, related to inherent bias that some of these institutions may have towards an agenda. Although it was also stated that they could greatly benefit from scenarios searching in depth what could alternatively happen in the future. For government agencies the biggest challenge would be trust in continuity of the activity, due to their political nature.

The fourth layer investigated a higher level of perception, in order to identify if the participants perceived if academia adopted scenarios, could it better support the forestry sector. All respondents were positive in saying that yes it could. It was from this question that two very interesting answers arose. First that college or university could become a leading beacon for its sector and society in general and second, that preparing the students with concepts related to scenarios could reshape the industry and other related stakeholders.

6. Limitations and Lessons learned

6.1. Limitations

A few points became clear during the experiment, regarding positive aspects of scenario planning and inherent challenges to success.

Regarding the challenges, perhaps the most significant problem of this experiment is related to the potential of attracting participants that are already prone to the use of alternative tools in their work. I

was aware of this problem before starting the experiment. The safest approach to address this problem would be random selection of participants with compulsory participation. This was impossible to achieve. The best approach was taken, asking the support from each Department Head to identify potential students and professors. As participation was voluntary, there was clear potential for bias.

A second factor to consider is the size of the sample. The nature of the exercise demands a considerable investment of time from participants. This fact hinders the possibility of achieving greater numbers of participants and the time available to complete the project also impedes having a greater number of workshops. Due to this fact, the project has no pretense to claim that the opinions reflect the thoughts of the majority of the forestry HEI community, but as a sample of challenges that exist in the minds of a few members. Related to the first and second factors is the distribution of participants. Initially the project sought to have equal numbers of academics from each of the three departments. This goal was not achieved as there was an imbalance among department members. This can highlight the bias factor and enhances the sample challenge. The project also sought to differentiate the two workshops as student and faculty. This goal was also not achieved as the second workshop was significantly short in faculty. To have the second workshop, it became necessary to complement the numbers with students. For this reason, comparisons between student and faculty opinions were not developed. Still the second workshop was kept in order to have input from faculty. In order to address this, the results were analyzed as academics in general.

6.2. Lessons Learned

During workshops the environment was generally cordial and respectful. Even though the proctor did not clearly state the behavioral rules. For the second workshop which involved faculty and students these rules would be even more relevant. One person from each group did comment on this fact independently.

Particularly with the student's workshop, which was my first experience coaching for a scenario planning workshop, It was a great experience and taught a few important lessons about me, the participants and the tool.

Starting with the key insights I gained, it became clear that I needed to improve my control of time. Even though in a scenario planning process where we need to be open so that the participants have freedom to reflect and challenge their concepts in an event severely limited by time I needed to learn to be more objective in my answers to doubts and define time deadlines for the discussions. Another lesson was that I am very tempted to join in the discussions, particularly when discussing trends and future for a

given subject. Even though it did happen a couple of times, on the second and third days I was able to do a much better job in restraining myself.

Regarding the participants, there are different subjects to discuss. First, the relative inexperience of the students, especially due to their younger age and mostly to the subject could have pushed them to focus on higher level facts and in a generic way. The focus when developing the scenarios was more on the macro events (forces) such as climate change and was shy on the particular trends related to higher education. Second, the participants, especially in the first hours were very worried about getting the right answers. This is understandable as many people believe that "for a question there is a correct answer". It was clear to see the students struggling in not "getting it right" from the beginning. This can also be seen as a success in pushing the participants out of their comfort zone and reframing their concepts. A third aspect is to fully understand that different people will have different levels of comprehension of reframing and alternative futures, different from the expected. This can lead to some level of frustration for some participants. To keep them engaged and how to do it is ultimately important because their contribution can be most valuable.

Regarding the tool itself, a few realizations were made: First the mechanics proposed did work well together to deliver the intended information. Second, for participants that have no experience with scenarios, two factors were extremely helpful for the understanding of the potential that scenario has: A) to develop an official scenario does help for the development of alternative ones, especially for a short session such as in this project; B) The development of the strategy for the alternative scenario was key for the realization of the impact that scenario planning can have for strategic planning for some participants. For one of the students that had a very practical approach to forestry, at the beginning of the development of the strategy for the Green capitalism, he understood and expressed it saying, "oh this is cool". Until then he had been rather skeptical of why to do this.

7. Conclusions

Even though not all the trends identified in the review were discussed in depth during the exercise, many of them were present in the responses. Trends such as governance, education cost and the role or identity of the HEI were constantly presented as reasons for change or challenges to change. The exercise helped me realize how factors such as the tenure track or tenure-like track can actually hinder the preparedness and adaptation of a HEI if not brought to the surface for discussion. At the end of the exercise I came out with bigger clarity of the paradox that HEI's are being put through. It is clear the huge opportunity to capitalize that education institutions have with the emerging knowledge-based economy,

but they are struggling with inner ghosts, while facing external forces such as reduced funding. This understanding from the participants answers reinforced in me the relevance of institutions such as this college, to improve their approach towards strategic planning. To look at scenario planning as an investment and take the necessary time to revisit their identity. Today, maybe, the focus on the vision is becoming as relevant as looking at the mission and I am more convinced that tools such as scenarios can contribute to this college.

Despite the potential for bias discussed in Chapter 6, the results are still valuable as the information gathered comes from regular members of the academia, carrying the perceptions of the general opportunities and problems their institution faces and which corroborate a few of the trends portrayed in the literature review developed (item 5.1) Trends in higher education. Most important is to understand that to initiate any process of transformation, it is common if not necessary to have a window of opportunity to introduce a concept or tool to a community. The participants in this exercise are as valid as any or maybe even more, considering that if there is bias in identifying with new tools, they may be even more enthusiastic in promoting it than others.

The Perception chain confirmed that there was an in-depth understanding of the potential uses of scenarios, their benefits and challenges. From layer one to layer four, the answers were well based and were realistic towards the challenges the adoption of the tool can face. This provided two conclusions: First was the fact that the message had been transmitted well enough for a good comprehension by the participants. This not only reflects on the exercise but also on my personal experience as a facilitator. Second, and most importantly, is that the fact that the concepts were clear within the responses gave me the confidence to analyze the results against the main questions of the research, the relevance and feasibility of scenarios for a forestry HEI.

From the answers it was possible to characterize a forestry HEI within a few parameters. The strategic planning process mimics some of the conservative approaches that pertain to the forestry sector, such as being more reactive to the social and economic environment, not very inclusive in strategic planning and that time for planning is seen more of a cost than an investment. The participants also agreed that elements of TUNA are growing and that forestry HEI's should evolve to include them in the strategic thinking process. Overwhelmingly the responses were clear that scenario planning can be highly relevant for academia, due to promoting diversity of opinions to the discussion, including TUNA elements in the planning process, widening the future of possibilities to the institution and others.

If the relevance was clear for the participants, also were the challenges to implement the tool for an HEI. The standard approach to strategic planning of a HEI and the time necessary for the development of strategic process and the added time needed for a scenario planning were pointed as the most significant

challenges for the adoption of scenarios. Second to time, cost was cited many times, which in my analysis is included as a factor in a standard strategic planning approach. The combination of these challenges drove my reasoning and conclusion that strategic planning is seen, within forestry HEI, perhaps as a necessary cost but not as an investment. During the interviews, despite many challenges being stated, only two potential solutions were offered towards the adoption of scenarios.

- First was that when bringing in new professionals for faculty positions or administrators, that on the desired profile, skills such as openness to new approaches for strategic planning and inclusiveness, to be included. This can be effective but still depends on an active person or group to make this happen. Another challenge could be that the institution to be receptive to have professionals for such positions not related to forestry, in case of not identifying a candidate with the necessary skills and forestry background.
- Second relates to the NextGen sub-theme, which suggests that the best way to make significant changes not only for the education institution but for the forestry sector as a whole is to have in the curriculum, classes that develop the awareness and skills to deal with TUNA elements.

From the challenges presented and the solutions offered, I conclude that it is feasible for scenarios to be used by HEI's, but not simple to achieve. Even though all participants addressed the significance of these challenges, none of them were perceived as insurmountable obstacles. Actually, two suggestions were offered as how to introduce the concept in the institution. It will require an agent of transformation, to seek an external professional or that some faculty member invest in the skills and adopt it in their teaching. In this case, tenure track governance, can be a key positive factor. Even though not directly stated in the responses, it is fair to assume that the agent can also be one from the administration, that decides to expand its options.

One of the assumptions that motivated me to develop this project was the concept that Universities could become "Think tanks" for their industry and society. Answer number 08 in annex 9, had as its main goal to explore this idea. The statements made, that HEI's would become leaders in their segment and the fact that both independent plausible scenarios developed, contained in their stories that external partners would be brought in to discuss the future of the segment, made me optimistic. I think this is a valid assumption that should be further explored by HEI's.

My personal goals for this project were two. First to test and improve my skills as a facilitator in a scenario planning project, as until then I had only worked with it as a participant and on literature. These workshops helped not only to improve my skills and familiarity with the tool but also all the prearrangements necessary to make it happen. Second was to sensitize the college to the challenges ahead

and offer a potential path to seek. Scenarios is not the only approach nor the salvation for all problems, but in its method, there are tools to help understand and cope with a faster pace of change that carries TUNA elements in its wake. I hope I have contributed with my share to this end.

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9. Appendix

Annex 1 – Letter for directors

Letter for Directors

Dear Director,

my name is Rodrigo Portugal, I am Brazilian student, developing my Master science at FERM, having Prof. Chris Knowles as my adviser and Principal Investigator.

My thesis project proposes to evaluate a combined tool of scenario planning and backcasting to help to integrate uncertainty and ambiguity in the strategic thinking processes of forestry higher education institution.

To achieve this goal, the project will be developed in two phases, first a study with graduate students and a second with faculty from the CoF. For both groups the study will be developed through two workshops and interviews.

The title of the work is: **The forestry higher education role in the future. Preparing for uncertainties in a fast and changing environment.**

The scenario planning workshop, seeks to develop two contrasting scenarios of the future. It is scheduled to be held in two separate days with a duration of three hours per day.

The backcasting workshop, will work with one of the scenarios, chosen by the group to develop strategies and policies necessary to achieve or avoid the scenario. It is scheduled to be held in two separate days with a duration of three hours per day.

The goal of the workshops will be to answer the question: What will be the role of higher education forestry institutions in the future?

After the workshops the participants will be invited for an individual interview to collect their opinions of the applicability of the tools.

The goal is to have at least two students and two faculty from each department represented in the study.

To improve the level of participation the college will offer financial incentive of $ 150.00 for each participant faculty and graduate student. The incentive will be distributed directly to the faculty member's SPA account. For graduate students, the incentive will be distributed to the SPA account of their major professor with the funding earmarked for support of the graduate student in their degree program including travel to a conference.

At this time, I come to ask for your support to invite your graduate students and members of faculty to participate in this endeavor. If you agree would you please distribute the invitation letter attached to your mailing list?

Contacts:
Principal Investigator: Chris Knowles (Chris.Knowles@oregonstate.edu)
Student team member: Rodrigo Portugal (salleser@oregonstate.edu)
IRB contact: irb@oregonstate.edu

Thank you for your attention,

Rodrigo Salles e Portugal

Annex 2 - Invitation/ Consent Letter for Participants

Invitation/ Consent Letter for Participants

Dear Colleagues,

my name is Rodrigo Portugal, I am Brazilian student, developing my Master science at FERM, having Prof. Chris Knowles as my adviser and Principal Investigator.

My thesis project proposes to evaluate a combined tool of scenario planning and backcasting to help to integrate uncertainty and ambiguity in the strategic thinking processes of forestry higher education institution. To achieve this goal, the project will be developed in two phases, first a study with graduate students and a second with faculty from the CoF. For both groups the study will be developed through two workshops and interviews.

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The goal of the workshops will be to answer the question: **What will be the role of higher education forestry institutions in the future?**

The goal is to have at least two students and two faculty from each department represented in the study.
After the workshops the participants will be invited for an individual interview to collect their opinions of the applicability of the tools.

For the purpose of developing this research, I come to invite you to participate in this endeavor.

It is a voluntary participation, in a safe environment where your personal information will be confidential and erased at the end of the study, with no personal data published. The participation and information collected will have no effect on participants grades or relations to professors in the college.

The college will offer financial support of $ 150.00 for each participant faculty and graduate student. The incentive will be distributed directly to the faculty member's SPA account. For graduate students, the incentive will be distributed to the SPA account of their major professor with the funding earmarked for support of the graduate student in their degree program including travel to a conference.

Contacts:

Principal Investigator: Chris Knowles (Chris.Knowles@oregonstate.edu)
Student team member: Rodrigo Portugal (salleser@oregonstate.edu)
IRB contact: (irb@oregonstate.edu)

Thank you for your attention,

Rodrigo Salles e Portugal

Annex 3 – Scenario planning study case

The early stages of Scenario Planning, the 1973 Global Oil crisis

In the early days of October 1973, the world economy was hit by a political embargo as a response from Arab countries, members of the Organization of Petroleum Exporting Countries (OPEC), to the aid from US to Israel at the beginning of the Yom Kippur war. Oil exports were banned to targeted countries and production was reduced purposely (Milestone, 2016). As a result, crude oil prices rocketed from $3.00 per barrel in 1973 to $12.00 in 1974 which left astonished citizens, whose livelihood was affected across the globe. Allies within the North Atlantic Treaty Organization (NATO) adopted different international political alignments, siding with Israel or with OPEC countries. The perceived shortage of crude oil spurred investments in new areas such as Alaska, alternative fuel such as ethanol and new energy sources. The automotive industry migrated to higher fuel efficiency cars, opening and reducing markets for brands of different origins, totally reshaping the automotive industry (Macalister, 2011).

In the U.S., the economy had grown increasingly dependent on foreign oil (Milestones, 2016), and was acutely strained, what deepened further the crisis at global level. To incentivize prospection of new oil sources, the Nixon administration implemented a new oil source incentive, where existing sources of oil had a max price limit and "to be discovered" sources would receive a premium. The policy backfired leaving less "old" oil available, increasing scarcity, and discouraged investments in new energy sources (Frum, 2000). In 1974 a Federal speed limit rule of 55-mph was in place to enforce more fuel-efficient speed (Kamerud, 1988). By the 1980's big luxury cars were no longer made in favor of more fuel efficient 4-cylinder engines. In many states citizens where required not to put up Christmas lights and in Oregon Christmas and commercial lighting were banned altogether (Frum, 2000).

Even though reasons for such crisis went beyond the embargo, a fact is that U.S. energy policy and most of the world's, rested on a comfortable prediction, that OPEC exporters couldn't or wouldn't exercise their sellers power triggering an unexpected scenario.

In the aftermath it is obviously easy to assess past events and analyze reasons and outcomes. The real challenge is to identify what questions should be made, in particular, the uncomfortable and unknown ones. Tricky affirmative? While many countries and companies were surprised and heavily affected at different levels with the crisis, one company was developing a different approach when these events were happening.

In 1965 Royal Dutch Shell put into service a computer-based model to improve the company's planning capability, the Unified Planning Machinery (UPM). At the same time the company began a new initiative, "Long Term Studies", the scenarios team, which was the beginning of an ongoing effort to develop long-term outlooks in the form of alternative plausible futures (Wilkinson, 2013). In 1971 Shell identified the possibility of power, shifting from a buyer to a seller's oil market, with the oil producing nations interests driving production and cuts, instead of a constant increase market demand foreseen in a business as usual version of the future (Wilkinson, 2013). With this approach when the crisis hit in full, the company was envisioning to diversify investments looking into alternative energy sites and sources. Most remarkable was Shell's pioneering efforts in developing the oil fields in the North Sea. The most difficult offshore work the Group had ever undertaken pioneering the push into deep water technology and production (Shell, n.d.). When the second oil crisis came at the end of the 70's, the Group renewed

its search for non-OPEC sources of oil and sought further diversification into renewable energy. It also moved into other areas such as forestry, construction and alternative fuel. Out of this came its interest in biomass integrated gasification, and eventually the new biofuels of which Shell is today the world's leading distributor (Shell, n.d.).

This is not evidence that Shell can anticipate changes in future better than other companies. What is perceived by researchers is that its approach renders the group more sensitive to shifts in the market and culture (Wilkinson, 2013). The approach has improved the company's strategic planning, incorporating unpredictability in the thinking process, which came to be known as Scenario Planning (SP).

Even though not a recent developed tool, it gained importance as strategic planning evolved. Since the beginning of the cold war, scenario planning has been used to integrate uncertainty in strategic planning for military purposes. In the 70's Shell brought these tools into the market realm and they slowly gained importance. It was until 2001, with 9/11 events, that scenario planning tools had a surge in adoption, climbing 70% in use at global level, double the average of the previous decade (Rigby and Bilodeau, 2007). These tools have been used in a wide variety of areas, such as the military (nuclear war games) (Wilkinson, 2013), business decision making (oil crisis) (Wack, 1985), political outcomes (South Africa's path out from apartheid) (Kahane, 2012) and human health (UN AIDS program in continental Africa) (Fourie, 2004).

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Workshop activity

- Welcoming and introductions of participants
- Workshop slides Presentation
    - Global context
    - Higher education trends
    - Scenario planning core concepts
- Development of the Official future scenario
- Defining the endpoint
- Development of two alternative, plausible scenarios
- Describing the scenarios

Annex 4 – Interview questionnaire

Interview Questionnaire

The interview questions are organized in two sections guiding participants to reflect on the relevance of scenario planning for the forestry academia and the feasibility of successfully applying the tool.

The first section

1) Did scenario planning affect how you perceive the future? Please elaborate.
2) Would scenario planning be a useful tool to prepare higher education institutions for their role in the future?
3) Would the scenarios be useful for the decision makers of your institution?
4) Elaborate on the positives and negatives of the tool.
5) If there was a board to develop scenarios for your institution would you be interested in participating?

The second section

1) Is there an added value in using this approach in comparison to the standard strategic planning approaches in dealing with the future of the forestry academy? Please elaborate.
2) What are the challenges for scenario planning being adopted in a forestry higher education institution?
3) Could there be other clients for these tools in the forest sector, besides the academy?
4) What are the challenges for scenario planning being adopted by other stakeholders in the forestry sector?
5) Could these tools be useful for the academy to better support the challenges and opportunities for the sector's future?

Annex 5 – Graduate student workshop scenario

Graduate Student Scenario planning workshop
Forest Higher education Scenario developed
Scenario Name: Green Capitalism
Timeline: year 2049

It is the year of 2049, climate change, a world concerning event for over 50 years, is now finally tackled through huge incentives from Governments worldwide and significant investments from the companies and corporations, where environmental tech became the new business. Despite global society coping with such a challenge, it came only after deteriorating conditions affected the global society at its core.

At the end of the second decade of this century, countries still were far from agreeing on how to deal with climate change. The low commitment of major economies to find solutions weakened the efforts such as the Paris agreement and no common ground was ever found.

In the next decade, the effects of global warming became more pronounced with thousands of catastrophic events occurring around the world. Intense storms, droughts, floods, and wildfires were more frequent and severe, affecting several sectors such as agriculture, forestry, energy, infrastructure, tourism, and insurance. In 2028, a new effort was made due to two major events. First, the loss of species started to weigh heavily on companies profits and in some cases survivability, in major economies such as those from the developed countries. The second event was a severe loss of water availability, in particular after the great drought of 2027, which raised the alarms for food security, further straining the growing problems with land allocation. These events propelled huge manifestations worldwide, putting governments of all types and colors under pressure to come together and put checks to stop the deterioration of the environment and social living conditions. The UN World Climate Crisis Board was established in the wake of the Frankfurt Climate Crisis agreement when all world countries Governments sat together. The board was constituted by governments (to establish the policies), the industry (to finance the endeavor), and a network of universities and research institutions from all over the world, tasked to develop and implement solutions with renewed importance focused on sustainable technology. The legislation was reviewed and developed to eradicate bad environmental practices and an international quality standard was developed, boosting a market for sustainable certification companies. The legislation was put in place under trade agreements endorsed by the World Trade Organization (WTO). Society willingness to pay for sustainable products significantly increased and sustainability became a mandatory social license to operate. Programs of large-scale incentives were established to promote the development of solutions.

The private sector became responsible for the majority of the burden of the investments to cope with the new order. As a trade-off, industry organizations lobbied heavily for ownership of the new technology developed, demand to which governments capitulated to. A strong and profitable market for

environmentally responsible goods was established under relatively loose intellectual property regulation.

The academy initially brought in as a support to the board quickly became a cornerstone in the new environment. Holding the expertise to attend to the demand, most of the higher education institutions boosted their research capabilities as this became their driving activity. These institutions took advantage of the loose proprietary regulations, further developing their capacities for fundraising and expanding their participation as market competitors through product ownership. The agriculture and forestry sectors severely affected boasted stronger support from society to their research institutions. Forestry higher education institutions, in particular, faced harder times as government funds were directed mostly to food security. While many colleges closed, a few universities such as Oregon State University College of Forestry, for existing in an economy dependent on the forest industry was able to capitalize on the new environment opportunities.

Annex 6 – Graduate student workshop strategy developed

Student strategic workshop

Scenario: Green Capitalism

A pretend exercise was used by the graduate students to further improve the understanding of the potential use for scenarios.

The stage was set as if the Dean of the Oregon State University College of Forestry (COF), analyzing the "Green Capitalism Scenario" (GCS), asked the group to develop a strategy to cope with such scenario. The results were as follows.

Initially, this "strategy" was thought as a proposal to be developed and kept on the shelf, having a trigger to spring the COF into reassessing it. In the end, the group decided that it should be put in place due to its relevance to the GCS and its potential to lead the COF into a position of leadership in the forestry sector as a become of innovation in green technology.

Despite COF's leadership in US forestry today, the students determined that the college was not prepared to face the challenges nor to take advantage of the opportunities the scenario could offer. The main constraint identified was the low level of interactivity among the departments, their goals, and achievements. On the other hand, the independence of each department was highlighted as a key asset to be kept, permitting the freedom of thought and research development.

The group determined that to be able to tackle the challenges of climate change, develop technologies to support society's wellbeing, and become a beacon of innovation in green technology, an internal organization should be created within the CoF. In this institution premises is that any proposal has to be a research of common interest; the research lines should be developed seeking to better balance the research

developed from a reactive to a proactive stance; it should become self-sustained. This institution would be put in place in two phases:

- Phase 1 – The first goal is to improve the interactivity between the three departments. This would be achieved through the implementation of a permanent collegiate of professors and graduate students from each department, meeting regularly to present lines of research and seeking to identify common challenges and opportunities. The collegiate would also have the opportunity to receive training on subjects that can improve the understanding of the COF role within the forestry community. The development of research projects and new lines of research would be stimulated for projects that involve more than one Department. The process of integration would have a deadline of two years.

- Phase 2 – Achieving maturity within the college, the institution would open its scope and invite other stakeholders from the forestry community and from other activities where synergies are identified. Representants from the Industry, Government, and society would become permanent members of the collegiate, allowing it to evolve into a cooperative research institution (from now, the Institution), hosted by the COF. At this phase, the institution would seek strongly for self-sustainability, from the industry and official funds such as Governments and national and International organizations (e.g. FAO, IUFRO, World Bank). The COF would act as a hub that interconnects different players, matching funds with needs while studying trends and their potential consequences with the vision of becoming a leader in green technology innovation. To achieve these goals, a strategic plan will have to be established, driven by the vision developed by the Institution.

With the establishment of this research program, a possible result could also be the creation of a new major within the COF based on the activities of the Institute (E.g. agroforestry engineering, non-wood

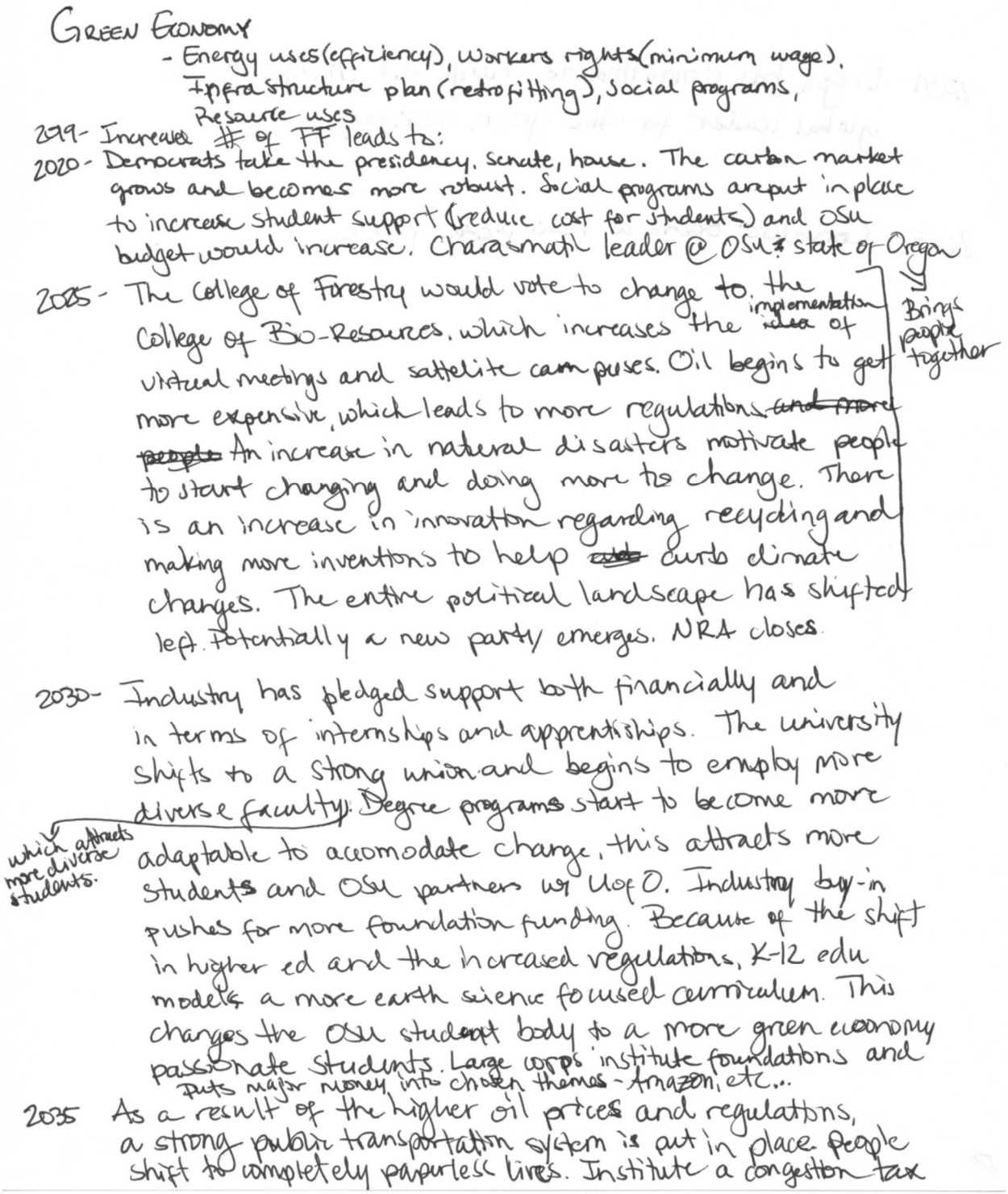
forest products management, ecosystem services engineering, urban forests management). The Institute would rely on the professoriate from the three departments, reducing the maintenance costs. The funds from the new students could also support the COF. The success of the Institute would contribute to depending less on government funds, and minimizing the stringencies imposed by the reduction of Federal and state funds.

Partnering with other research institutions (e.g. College of Agriculture and other higher education institutions) would help to improve the COF's research as the Institute will not only be tailing normal ferrety but also other aspects such as food production, land allocation, and energy. The Institute could play a crucial role in better understanding and providing solutions for the non-commercial uses of the forest.

It is the understanding of the group that by developing the Institute, the COF will keep up with the demands ahead and be properly prepared to cope with the Green Capitalism Scenario.

The second phase is expected to be fully implemented and working within a period of five years after the first phase. A landmark would be to have the first results from its activities after two years of its creation.

Annex 7 – Academia Green economy scenario developed



GREEN ECONOMY
- Energy uses (efficiency), Workers rights (minimum wage), Infrastructure plan (retrofitting), Social programs, Resource uses

2019- Increased # of FF leads to:

2020- Democrats take the presidency, senate, house. The carbon market grows and becomes more robust. Social programs are put in place to increase student support (reduce cost for students) and OSU budget would increase. Charismatic leader @ OSU & state of Oregon

2025- The College of Forestry would vote to change to the College of Bio-Resources, which increases the idea of implementation of virtual meetings and satellite campuses. Oil begins to get more expensive, which leads to more regulations ~~and more people~~ An increase in natural disasters motivate people to start changing and doing more to change. There is an increase in innovation regarding recycling and making more inventions to help ~~with~~ curb climate changes. The entire political landscape has shifted left. Potentially a new party emerges. NRA closes.

Brings people together

2030- Industry has pledged support both financially and in terms of internships and apprenticeships. The university shifts to a strong union and begins to employ more diverse faculty. Degree programs start to become more adaptable to accomodate change, this attracts more students and OSU partners w/ UofO. Industry buy-in pushes for more foundation funding. Because of the shift in higher ed and the increased regulations, K-12 edu models a more earth science focused curriculum. This changes the OSU student body to a more green economy passionate students. Large corps institute foundations and puts major money into chosen themes - Amazon, etc...

which attracts more diverse students.

2035 As a result of the higher oil prices and regulations, a strong public transportation system is put in place. People shift to completely paperless lives. Institute a congestion tax

2039 - Oregon has committed to change and emerges as a global leader for the green economy.

2040 - Corvallis opens a new pizza place

Annex 8 - Academia Redd future scenario developed

Redd Future

2022
- Elimination of bace-core classes to reduce overall cost of the degree programs. Classes will be selected based on student interest and classes will be on an S/U model President proposes not to cut the core, but faculty senate voted against him. Congress shifts back to Republican. Oregon shifts to republican based. Bace-core is achieved through community colleges

2025- Major layoffs imposed, state and federal funding get cut significantly. Masters tenure track positions start to replace Ph.D. track. Enrollment starts to dip due to overall federal student aid funding. More classes start to get replaced w/ distance ed.

2030 - Research gets privatized due to complete elimination of federal and state funding. Funding slowly shifts to foundation or private based funding.

2035 - In response to government, a gap year is institutionalized, causing and influx of new students. The student body would shift into intense, passionate intellectuals. Overall enrollment would be as around 12000 students.

2039 - Employers will begin to value unprescribed educated individuals because of their soft skills and broad education.

Annex 9 – Interview answers

Interview Answers

Answer 01. Did scenario planning affect how you perceive the future? (Question 1)

Question 1 seek to identify if the core premises presented, through the method, had an impact at any level, to a participant individually. This corresponds to the first layer of perception from the participants to their own experience with scenarios. During the interviews, the participants were encouraged to develop on how.

From the eleven participants, nine of them informed that the exercise did change how they think about the future. From these a few important reasons showed in their justifications such as:

Orderly out of the box: The majority of the answers highlighted the importance of "thinking out of the box". This notion will be repeated many times later during the interviews. What was interesting to notice was the concept many respondents gave to be able to think out of the box in an orderly fashion. Which should be one of the main goals of any methodology used. For strategy thinking an exercise without such an approach, will probably render very insignificant results, if any. When dealing with uncertainty, such as scenarios propose too, it becomes even more relevant. This aligns perfectly with the core premise of reframing, which to be achieved needs to take the participants out of their comfort zone, being exposed to different interpretations from others and to challenge their own concepts.

"…it's really a good way of formalizing ideas and notions that are out there. But because we don't have time or don't feel comfortable. We usually ignore."

"The fact to get people to think outside of the box, and also getting people to get comfortable with change, it's a way to get lower resistance to change. So, when you get used to that, you become more comfortable in making decisions when it, where it really counts, outside of the scenario planning environment."

"Yes. Even though I use to think in future scenarios, I haven't done it in such a complete way as I can do now that I know the tools and procedures about scenario planning."

Wider future: Another core premise was identified by the participants, that there are many potential future scenarios that can happen, which depend on a collection of factors that individually we can consider irrelevant until you face it through someone else's lens.

"when you start planning or role-playing like in scenario, it's like, actually there are some factors and some elements in the laughing that can also be in the future. Things that you don't take into consideration, but they can bring a lot to you."

"Yes, the exercise changed how I perceive the future by broadening my imagination to the endless possibilities available."

Business as usual, this category, even though not particularly related to the scenarios premises, it is a bedrock for any sort of planning at any level for the future. These two answers were very interesting to come up, for two reasons. 1) These two answers highlighted a fact that probably is taken for granted. That to stop to plan ahead is something that naturally happens. 2) Both replies came from two highly skilled professionals in their fields.

"Yeah, absolutely…. there's a saying, I'm too busy chopping wood to sharpen my axe. So you're not always very effective if you're not stopping now, to prepare and plan and think about, why do I do what I do? How about what we do now? How will it be relevant for the future? education? Yeah, that was good, and to be in a room of other people doing that."

"Because if you're learning or doing things that….constantly, doing every day the same thing and thinking about the things just to get to that goal, It's like you stop actually thinking about what and how the real future could look like."

One participant answered that it did not change how he perceived the future. It seems that the respondent had a different interpretation of what the word "perceive" in the question meant, assuming, possibly, to predict the correct scenario. At the end of the reply I explained once what I meant, using the sentence "how you see that the future can be" and that I did not mean to "predict". The participant confirmed the reply so we moved to the second question.

"I don't think so, that it can have too much influence in the way how I, or someone, can perceive the future. But it can give you insights and ideas to understand how companies or organizations, can use this kind of methodology, how they were to try to predict, or to try to work in advance on the things that can produce or happen in the future."

Throughout the replies to the question, the concept of collaborative work permeated many replies, within all the themes identified. Even though this is a common premise for most brainstorming tools, it is one of the core premises and highly encouraged to achieve success with the method.

Answer 02. Would scenario be a useful tool to prepare higher education institutions for their role in the future? (Question 2)

Question two, seek to identify mainly, the relevance of the tool for the client of the exercise. It moves one level up in the chain of perception from the participants, geared towards the client of the study. It helps to understand what type of links the participants made from the method to a real entity.

The participants made a series of links that could be organized in three main themes that could be split in sub-themes (Figure 19).

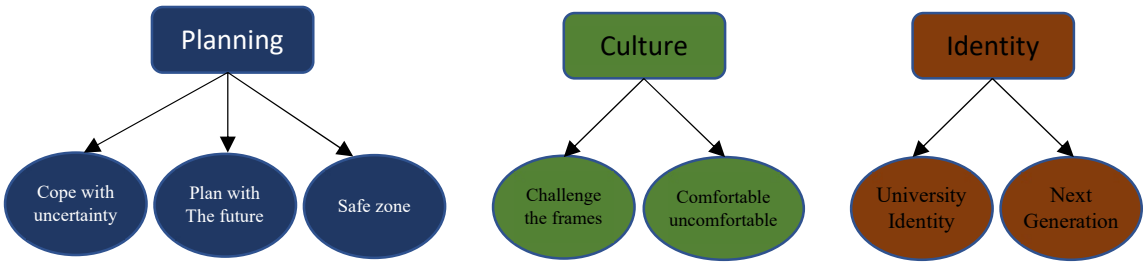


Figure 19: question 2 Themes

All answers were positive in stating that scenarios would be useful for higher education institutions prepare themselves for the future.

From the concepts presented the need to plan was the most discussed, followed in close by the development of a different culture within the institution and the importance of revisiting its own identity. These three themes included important concepts discussed by the group during the workshops.

Planning - with the future, not relying exclusively on the past experiences. This is one of the core principles of scenarios, stating that when planning a better balance between past and future is encouraged, devoting more focus on the future itself and not only on the past.

Planning - Coping with uncertainty, which is the value added to a strategic planning process from scenarios. To help planners stretch their minds beyond the conventional thinking and include elements from TUNA, in the strategic thinking step of a strategic planning process.

Planning - Safe zone, even though it's not in the premises of scenarios, still it was presented by a few respondents, as an important factor. The safe zone is has an important role as a facilitator, for different aspects such as: it gives freedom to be creative; it can promote empowerment of all participants; permits to discuss potential challenges, without the immediate threat of a problem or even the loss of an opportunity.

"I think that it, it is, it could be really useful. Well, I think that the forestry higher education should be more intentional about the way that they're thinking about the future versus just reacting, I guess, to current forces on past forces. So I think creating a space for more of this kind of visioning of scenario planning could really be useful for the field."

"I mean obviously, you know, you have to look at what are the different alternative tools on that context (TUNA)*, and in that context it definitely it is."*

"Yes, just because you can make different assumptions I guess or situations and address them and for them without actually being in a problem, right, so your preparing potential solutions for any problems that might arise or others that can arise in the near future."

Culture – comfortable with the uncomfortable, this concept permeates any discussion related to TUNA. Probably it is the main bias in strategic thinking process, due to elements being avoided because of fear, accommodation or desire. To get comfortable with the uncomfortable is embedded in the ability to reframe our own boundaries to be able to reperceive reality through other lens.

Culture – challenge the frames, is intrinsic to the method, particularly to the OSPA (Oxford Scenario Planning Approach) which this project was based on. Participants identified this as key to cope with elements from TUNA.

"Yes. Definitely. I do believe that. I mean this scenario planning, for any good science department on the world can think, as I said before like, what components are, what elements should be brought to the table, so their professionals are better and they actually know how to face those situations that we are not even thinking about in the future."

"Yes, that would be that is a really a useful, a really efficient tool for higher education institutions to try to figure out what scenario they can face in the future, if that future scenario can move them to change the dynamic of the educational system that they have right now, or if they require to still get working in the same motivations that have been working on."

Identity – University, the need to revisit the a higher education institution identity came up as an important contribution of the workshop. This perception even though not unique to a scenario environment, was probably enhanced by the discussion of the trends and even more by the realization that different futures exist.

Identity – Next generation, this was a very interesting link of the identity to the preparation of the next generations in order for them to be able to cope with the changing environment they will face.

"So I think for this to be a useful tool, you kind of have to figure out what your mission is, not just what you have written down how you actually operate. What are the things you doing now? Is this moral? Are you a service provider? Or are you a public good? Because I think that's where we got some disagreement for how things should be in the future. So I think first you have to figure out, what do you want to be? And then I think then it's a very useful tool for brainstorming its different types of futures and how we might be able to prepare for them."

"I think what I got out of this workshop the most is that there is some disagreement about what university's mission even is. So, it used to be traditionally that we educated for education sake, and this is a public good. And going to university, it has value within itself. And now we've had this shift where universities value is based on the type of career that you get afterwards. I think there's kind of this identity crisis."

"Also because it's always important to think the future we are shaping. What are you teaching to prepare people for the next four or five years to the markets to the Future jobs, at least in that small time frame. It's important. But if we think, like, a broader time frame, it's even more important."

Even though these themes are defined to help describe the results, they are interdependent and work together to better explain the impressions that the method had over the participants. One reply was singled out as it represents well this sum of elements:

"I think it would certainly be a useful tool to get people to think outside of their normal strategic planning initiatives because I think the value and the benefit of scenario planning comes from people stretching their minds in ways that they wouldn't have previously thought of and so it allows them to really do some more creative thinking about how they go about their jobs and what they're doing in strategic planning for whatever institution they're working for. So, I think, that it's not necessarily the scenarios themselves that are the real meat and the real goal in the gain to be had from Scenario planning." ……" I think it's more about Training your people to think outside the box and think about these things, even if we know that might not happen in in whole but maybe parts of that we see as possibilities, we can actually plan for and come up with strategies either for or against those things that we see as plausible of happening."

Answer 3. Would scenarios be useful for the decision makers of your institution? (Question 3)

Question three continues to explore the perception of the participants on the both the relevance of the method and the feasibility of its application in higher education institution.

Most of the answers focused on the relevance, expressed through why scenarios would be useful for decision makers, and second on the feasibility, expressed through the conditions for its adoption. It is important to highlight that the reasons can indirectly have influence on the feasibility, as it can persuade a decision maker to adopt the tool. These two general themes were identified, 1) Reason for adoption by the decision makers, with three sub-themes and 2) Conditions for adoption by decision makers, including three sub-themes (Figure 20).

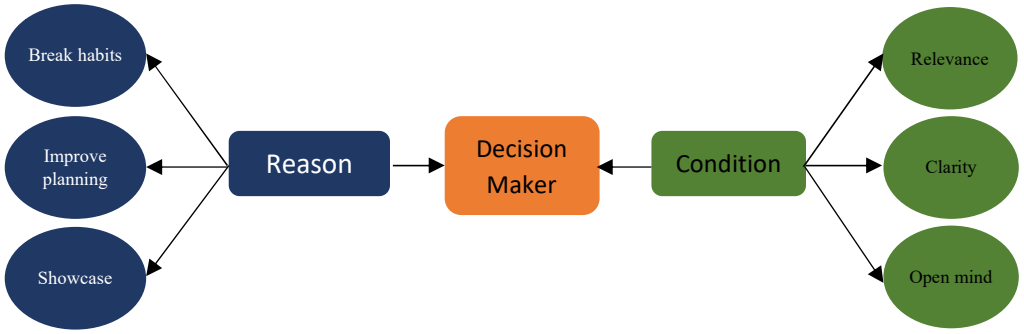


Figure 20: question 3 Themes

Reason: The reasons for adopting were consistent with the themes presented in question 2, particularly between "Planning" and "Culture", with the subthemes "Improve planning" and "Break habits" respectively from question 3. It is fair to assume that the Identity theme from question 2 is also appreciated in this theme, as revisiting the institutions identity contemplates planning improvement and breaking with habits in the context of TUNA elements.

"Yes. On that very clearly…..With scenario analysis, I think would prevent a little bit of some decision maker or group of decision makers to run with their pet peeve story and imprint that story on the whole outfit."

"Definitely I think most of the scenarios will be useful for institutions in general. I'm thinking in the ones that I've been working with, OSU or the "(Institution)*" that I'm working. …. Maybe we're doing something that is already obvious or something that is going against the current ideas. So, it's always good to step back and think again. What we're doing, where does it go? This scenario can always help to shape all that."*

The third subtheme "Showcase" was a very interesting example of a realistic use of scenarios presented as an initiative of one of the participants during the workshop. In this approach, scenarios developed, break away from the expected future and can be used to bring light to a different vision of the future, questioning standardized concepts, such as the one presented by the respondent in the argument below.

"I think when you're advocating for something, For example: "Business has done a very good job of convincing us: You can have environmentalism, or you can have this life that most of us have. That's not necessarily true. So to be able to show people like what this future looks like and get them excited about it can also be a good advocacy tool or internally for justifying certain initiatives."

Even though it was not clearly stated by the respondent, it is fair to consider that "Showcase" could also be a tool to be used to convince decision makers about its usefulness.

Condition: the three conditions stated are very objective, being the first two common sense for any strategic approach, including scenarios, and the third possibly more related to alternative methods.

Clarity of the information is critical to the success of any message conveyed to a decision maker. This is linked with the use of proper terminology to achieve clarity. Perhaps in the case of scenarios, where its description relates to a theoretical and unexpected future, these two conditions are even more relevant.

The third condition, Open mind, possibly relates more with methods considered alternative such as scenarios. The open mind condition relates to the challenge in breaking resistances related to build on standard planning approaches and to accept ones of the premises that uncertainty need more flexibility in the thought process. Still the information provided to decision makers must attend the two previous conditions.

"I think that they would be as long as the scenarios were very clearly defined.

And defined in similar and consistent terms between them. ….. and so I think, for decision making, they would need to be like very clearly defined with similar language, and in a way that is relevant to the decision maker, as well."

"Yes, if the decision makers were willing to open their minds, and the reason that I say that is because you can provide them with as much of the "IF/ THEN" scenario type stuff, but if they choose not to use it, then it's it is what it is."

Answer 4. Is there an added value in using this approach in comparison to the standard strategic planning approaches in dealing with the future of the forestry academy? (Question 6)

In question six, the goal was to learn what values, if any, were perceived by the participants that scenarios could add to the strategic planning process and its relevance to the client of the study. Second, to identify if the concept that scenario is a tool to add and not replace other strategy approaches had been successfully transmitted.

The grand majority of the participants agreed at varying from a "yes" to "absolutely". One participant declined to answer due to not being knowledgeable on strategic planning processes. From the positive responses, all focused on the concept that scenarios could support planning processes to be better prepared. The "Better prepare" theme had included three subthemes.

Expanded reality, most participants informed that scenarios can work as a reality check expanding the focus of planning teams from a narrower vision of the future into a multi-variable reality.

"….you know if you could get the same people (that do strategy here today) *involved. If you do it right with both using both approaches. We could do better. Because I see current approaches a little bit more linear."*

"I think if I reflect back on any kind of strategic planning I've been involved with in the past, It's been at least narrowly focused on strengths, weaknesses, opportunities, threats, and then, moving forward with that without stopping to think exactly where you're going? How you're going to respond to an external environment, that's a much bigger influence than just your small entity, right? The engineer in me wanted to say, well, this isn't really feasible. So why talk about it? On the other hand, I don't know what's feasible, I mean, I, this isn't really going to happen. How do you know that? And the moment you've decided, you're pretty sure it's not realistic. If you put too many boundaries on yourself. You may be surprised."

Building skills, was the second most answered. The statements presented included the individual gain in skill and the reflection of these skills on the results of a planning process.

"Yeah. I think it's an important part. It's it is part of the realm of strategic planning. I think, is just getting people to think outside of the box, but also getting people to get comfortable with change. I think it's also important because people can become resistant to change and so if your you're using scenario planning as a "What if" tool where there's an essentially low stakes early in the process. So if you get them used to that, I think that they'll be more comfortable in making bigger and more informed decisions when it, where it really counts, you know outside of the scenario planning environment."

this really allows the broader set of ideas to come forward. Hopefully be reflected in the final plan. but I like I said the big Advantage there is that the participants will come out. Quite differently on that. They've gone through this it will shape. They will then hopefully, you know, when they make other

decisions even private or smaller scale decisions something like that will stick to them, stick to their mind. I know it does with me that I look at certain decisions, now different than I did before I got interested in scenario analysis.

Build bridges, even though potential use of the scenarios were pointed out in the answers above, building bridges between the desired and the possible, was a highlighted. This deserved my attention as it seems to relate to the exercise of preparing an expected future during the workshop, which was not planned initially.

"I think with strategic planning, you have these, "this is what we want to happen". And it's valuable from, this is what we want to happen, but this is what might actually happen. So how do we respond and maybe bridge between, you know, what we hope to happen and what we expect to happen versus what could potentially happen."

Answer 5. What are the challenges for scenario planning being adopted in a forest higher education Institution? (Question 7)

Question seven continues to investigate, what would the challenges for the client be, to have scenarios integrated into strategic planning processes. The answers can provide insights towards implementing it. This question strongly relates to the feasibility of the use of scenarios and builds on questions two and three. The challenges stated were identified as follows (Figure 21).

Table 8- Challenges for Scenarios adoption in higher education institutions

	Themes		
Subthemes	Conservative	Cost	Trust
Business as usual	**X**		
Comfort zone	**X**		
Governance	**X**		
Financial benefit		**x**	
Time		**x**	
Continuity			**x**
Method			**x**
Inclusion			**x**

Trust was the most mentioned factor for adoption of scenarios. It appeared 11 times among the replies. It showed in three forms:

Continuity, relates to the belief that time and resources invested by participants in a scenario workshop developed within their institution wouldn't be wasted, due to low commitment from the decision makers. That opinions and decisions taken within the scenario workshop, would be seriously considered and integrated to the planning process.

Method, trust in the method has to be gained by the participants and by decision makers. This subtheme relates strongly with the clarity and relevance of the information developed. This also relates to the openness of mind of institutions decision makers.

Inclusion, is a word that carries a strong concept of acceptance of others and openness to their ideas. This concept came up regularly in the all interviews and strongly relates to the trust theme. Scenarios strongly encourage inclusion and diversity of professionals. This means to have in the same room, discussing at the same level, professionals with different levels of power. Also diverging opinions will arise and others that are exploratory. Participants of a scenario workshop have to feel safe that opinions related to the activity won't be held against them and that ideas will be respected.

"The challenge will be really to empower people. To have the have the ability to make meaningful contributions."

"I think that goes hand-in-hand with, they have to sell it to the governor, the legislature, the Public, this is a valuable thing to do. So we are learning with more. …. A big part of it is, trust that, people feel comfortable to speak, to make points that are critical and that may be extreme, or at least feel comfortable bringing up fixing viewpoints in."

It's actually three kinds of trust. Yes, those two and then the trust that the agency or that we see we can Implement them, that it doesn't get co-opted by some other interest.

The second theme most frequent was the conservative nature of the decision-making process. Three subthemes were characterized accordingly.

Conservative nature, is a topic expected to be represented as it is common to hear that the forestry sector has a conservative approach in regards to its strategies. These informal discussions are supported by literature when studying the sector. Terminology such as "resistant" lack of "flexibility" and "stuck" illustrates this perception among the respondents.

Business as usual, was used to describe the answers that involved a standard resistance to change or accept new ideas, perceived by the participants.

Comfort zone, relates to the resistance to ask hard questions or think different from the standard, choosing to accommodate a wishful future in the mind. Stable and predictable enough.

Governance, In this study, a particular aspect was highlighted in regard to the tenure and tenure-like track system. The remark is in line with one of the trends identified in the secondary data assessment.

"…. (difficult) *to get people on board with it from the start because the forest industry is pretty resistant to change and they sort of lag behind in technologically as well. Those are too big hurdles because that's going to take a lot of collaboration even within a company. …. The implementation would be challenging as well because of resistance to change and the lack of flexibility and ability to react quickly."*

To do it they (decision makers) have to get comfortable being uncomfortable loosening up the idea of control and all become more transparent. "there needs to be a real by in, and I mean, if it's done right this is little different commitment from participants to do that. You know, it's a not as easy to hide stuff especially in the essence of scenario planning process if they have their idea what they want to do."

"A lot of faculty that, especially that have a great benefit. Tenure system has benefits. But it also allows for so much freedom. It's got to be hard for managers to say, this is where we're going, everybody, let's go. And so you can be a very much an independent operator as far as what you do….., those changes are very hard to make, …. If they decided they're going to stay entrenched, keep focusing on the past, regardless of your scenario, that's what they're going to do, probably, and it's hard to make changes at that."

Cost, not surprisingly, was the third theme identified. Maybe surprising was the fact that it was the last ranked among the three stated by the participants. This ranking could be because no strictly financial data was available for the participants, for example, consultants. From the theme, two subthemes were identified.

Time, stated by the participants and experienced by all involved in the workshops for this project, certainly time was the most challenging task to be accomplished. It is fair to say that even though recurrent, it is not a challenge specific of scenarios.

Financial benefit, probably would be the most hard to achieve or even measure. When would the measurement be taken, how long to wait, what to measure? These questions probably are in the back of the mind a overwhelming majority of decision makers.

"I think their primary challenge is capacity, because it's time consuming, so convincing staff of the institution that It's a worthy use of their time is a challenge."

"I think especially now that universe is going through a really hard time economically speaking, so offering anything or any tool, any Workshop, anything, if there is not something that is going to be economically speaking in return to the university and to the college, I think that could be a problem."

For this question the themes "cost" and "conservative" nature had already been reflected in responses to previous questions and it's fair to assume that it would be represented here. It was noticeable though how strong the theme Trust was present in the minds of the participants as a challenge to overcome.

Answer 6. Are there other clients for scenarios in the forest sector beyond Academia? (Question 8)

Question 8 also moves into the third layer, to learn what the participants perception of the use of scenarios by other close related stakeholders are. This also seeks to explore the relevance and

feasibility of scenarios for the forestry academia. The interest of other stakeholders of the sector in using scenarios, can invest the method with greater value for a forestry higher education institution. Also, if the method can be applied by other stakeholders, this can have a stronger influence in the decision of the adoption of scenarios by a college of forestry. The respondent's answers focused on institutions, with a brief description of why.

Companies: The grand majority of the answers considered companies as the first potential users of the method, being cited by all participants. The "Landowners" and "certification" companies were highlighted in some of the answers and will be included in this theme. The arguments related to better prepare for the future due to facts such as innovation, climate change, invest in adaptability, competition and substitution of products.

"Yeah, absolutely. Because I work so much with the actual companies that hire our students, I could see a lot of them being very interested in using this tool. Partially because there is this idea in the wood products industry of being innovative. And so that then means you need to be looking at the future in a different way."

"I don't work with the landowners I work primarily with manufacturers, I think, probably the one entity more than any other that could really use long term scenario planning is people in forestry, because it's a long term…. They have to be looking at a new future, where things are going with climate change, are their different issues that are facing the industry. What do you do to get ready for that?

"I would say that maybe you can also have, as a client, also interested, certification agencies. Okay. It would be interesting in this case."

NGO's, in the answers, were considered to have similar uses as for companies. Beyond that it was highlighted that scenarios could help some NGO's to correct biases towards one selected scenario. This could potentially improve their message.

"I assume that NGO's be interested in that. especially for certain NGO's, because the Scenario analysis pays a little more attention to extreme values, not just the one extreme value but Extreme scenarios. So you get to think a little bit more about all the worst case scenario and what I would really mean but you'd have to put it in the context of the biggest setting because NGO's that right now run with extreme value only would be forced to put it in perspective. And so I would definitely think any outfit that which themselves to pull some longer-term planning can benefit from this."

Governing agencies, were depicted as having scenarios to be highly important for them and accentuated the difficulty to be adopted, due to the transitory nature of goals and directions that follow the whims of political change.

"land management bodies that are either collaborative or land management agencies like the Forest Service. They're already, to a degree, are planning for the future. Foresters are usually thinking on like order of 100 years of like tree rotations. So there's already at an extent, where it's being used, but I

would say, doing it in this way that encourages more open thinking and creativity, I think, could be really beneficial in many different parts of the forestry sector, timber companies."

"In the case of governmental entities, maybe not, because those entities have two many variable in the policies that they define, because these entities are regulated by who's in power, right."

Collaborative force management, was stated as a venue where scenarios could have or continue to have a positive impact in how to prepare for the future. The main virtue of the method for the agents involved in a collaborative force management was the ability to envision different possible futures It is fair to assume that these could become paths to introduce the concepts of TUNA and the importance to consider in planning for the future.

I have been reading articles lately about different technologies that are being used to allow people that are engaged in a collaborative force management, to envision future scenarios, or from like an ecological modeling perspective, but like choosing different conditions and decisions to then play that out into the future and then actually, visualizing, seeing a visual image of what this could look like, given like different scenarios.

"everybody's thinking about resilience right now and how to plan for the future in ways that are adaptive and able to handle disturbance and change that we can't know what's coming So I think this tool could be really useful in engaging many different stakeholders and ideas and viewpoints so that our land management and forest management systems are as resilient and adaptive as possible."

Answer 7. What would be the challenges for these stakeholders to adopt scenarios? (Question 9)

Question nine further explores in layer three, which were the challenges perceived by the participants to adoption of scenarios by other stakeholders. Similarly, to question eight, the participants organized their replies according to groups of institutions.

Table 9: Challenges for Scenarios adoption by external stakeholders

	Institutions		
Subthemes	**Companies**	**NGO's**	**Public agencies**
Comfort zone	**X**	**x**	**x**
Inclusion	**X**	**x**	**x**
Reactive	**X**		
Time	**X**	**x**	**x**
Money	**X**	**x**	**x**
Bias		**x**	
Trust			**x**

Theme	Color
Conservative	
Cost	
Bias	
Trust	

There was a plethora of answers which were organized in 4 themes (Table 9, color code) which were segmented into subthemes when necessary. During the coding, when in an answer wasn't clear regarding to which segment (Companies, Public or NGO's) the respondent had addressed it to, it was considered for all, unless it was clear in the context that it was related to one or two particular segments. This happened for the respective subthemes: Comfort zone, Inclusion, Time and Money. The information collected was then allocated accordingly in the three categories identified by the participants in the interviews. Companies received the biggest attention from the respondents, and six subthemes were identified, followed by NGO's and for last Public agencies.

Comfort zone, relates to the resistance to change, identified in the answers through words or statements such as: resistant, skepticism and why bother.

"I think the skepticism of saying, Well, if there's one thing about the future we can be certain is that no one is certain about it. So anybody who tells you what it's going to be like is going to be wrong, chances are, so that healthy level of skepticism to say, well, since we can't predict it, why bother?"

"*There are some companies that want to be ahead of the game. But I would say a large majority of companies within wood products prefer doing everything old school ways and are going to be very resistant to any change."*

"I think it's, I don't think the challenges are really any different than the challenges that we face here. That getting people into the right mindset, or, or thinking in the right way, and getting the right people in the room."

Inclusion, relates to a *modus operandi* that is commonly seen in many segments of the economy, in which only a few individuals are considered as prepared enough, worthy or interested to participate in a strategic planning exercise.

"Even when businesses do proactive strategic planning, it's often just with leadership and not people from all organizational levels who may have valuable insights. Homogenous points of view aren't good for this type of exercise."

"Public agencies….. (The challenge) *Quite in a bit in terms of the people that are really interested in the better good or whatever that formal goal, is it good for a great amount of people for the longest time."*

Reactive, approach to problems came up as one of the problems for all stakeholders. The reactive approach to the future was strongly stated for the companies but not for the other two segments. It was identified through words or expressions such as: pragmatic, short-term, get results tomorrow.

"Business also tends to be pragmatic, conservative, and prone to inertia. Taking people away from work to do creative brainstorming about future events perceived to be unlikely – much less planning to respond to them – may seem like a waste of time and resources."

"We get caught up in dealing with current crises and day-to-day work, and it's hard to push it aside and dedicate resources to proactive strategic planning for the future."

Time, relates to the amount of time necessary to develop a scenario study. This resource was considered for companies, NGO's and Public agencies. Words and expressions that identified were for example: Time, spending, taking people away, stop activity.

"(NGO's) usually under even larger constraints in dedicating time and resources to these activities"

"As far as their time available, back to that saying, I am too busy chopping wood to sharpen my axe. And I think they're probably the same way. We are too busy with the daily issues to stop and think about the future and where things might go."

Money, relates to the cost of employees away from their normal activities, the cost to have hire a professional to moderate the exercise and clear financial outcome. This was identified through the words and expressions such as: money, spending, dish-out my money.

"It's a always a factor of cost. So it's going to be worth my money?

"Number one is time and money, you know, and when I say time and money, I mean, trying to implement a tool, as this one (person) in a company imply to bring some experts that can teach the people in the company that can train the people in the company to work in the process."

Bias, was a challenge specific to NGO's. It relates to the promotion of one or a few factors in a potential future, attached to an agenda.

"NGO's they're painting on this different group with some of them that live by what I should call it fear or buy into a certain issue. You now need to keep that issue up on the burner and sense of relevance of urgency keep that in the public to so they can be seen relevant and I'm not sure that this process, these forces will push them a little bit away from that then they have to consider futures where they are not relevant."

"For non-profits and NGOs, a challenge might be the desire for a particular future outcome that biases their ability to thoroughly examine alternatives."

Trust, was specifically stated for Public agencies. It relates to the perception long term plans won't be sustained to complexity of their organizational structure.

"public agencies have tremendously complicated planning process, but I think they start with the trust issue. Quite a bit in terms of the people that are really interested in the better good or whatever that formal goal is….. That you know, they make a certain plan and that those are implemented in that Spirit. So there are some trust issues at various levels."

Answer 8. Could scenario planning be useful for the academy to better support the challenges and opportunities for the sector's future? (Question 10)

Question 10 goes up to the last layer of the Perception Chain, trying to further investigate the role that the forestry academia can have in the future and the potential impact that the use of scenarios, by the academia, can have over external related stakeholders. This question relates to one of

the assumptions of this project, that higher education institutions can play a significant role, as a “think tank” for the forestry sector.

The participants answers focused on two clear themes, designated as 1) Spill in and 2) Spill out.

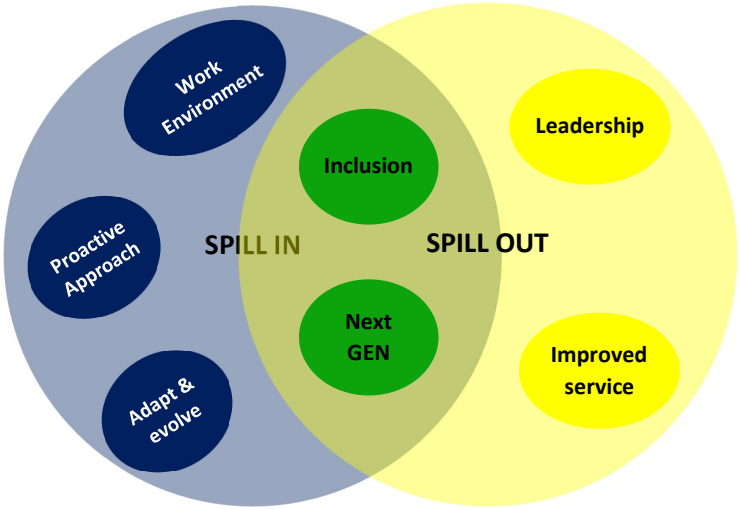


Figure 19: Question 10 themes

Spill in, relates to how the integration of scenarios can contribute the institution and indirectly potentially affect the stakeholders from the contextual environment. Three subthemes were identified:

Adapt and evolve: relates to the perception that exercises such as scenarios open the space to question the path of your institution, it opens your roof, to look beyond your walls and realize how much is changing, how fast its changing and where do you stand in the process.

“We've never had it in Oregon and we pride ourselves to be the last classical forestry program. WSU has changed, Humboldt is still there, Brooklyn is disappearing. So, the question I have is who really wants to be the last person standing. It's a good thing, for a while. It looks good. But in the end we have to change as everybody else got a head start and we may end up producing students that may be relevant to a very small proportion of the forestry sector and not producing the ones that will be driving the big ship because of the way we see ourselves in the future because the way we see the future.”

“It's amazing how quickly your strength becomes your weakness when things change. If you have personally seen that and I've been working on some issues and then I see some other stuff moving ahead and I think, “why is the Pacific Northwest not involved in this”? We should be on this as we are a big player and then It hit me, we’re working on our old issues. We don't have time for this new Stuff! Other people, they don't have old issues, so they’re looking for the new stuff out there.

Proactive, refers to que approach adopted by an institution, in regard to how does it deal with the future. How and when to allocate its resources to deal with problems and opportunities. Having a reactive position, for a higher education institution, surrenders its position as a leading beacon for the sector and grows the risk of be left behind.

"I think if they want to move away from being reactive and to truly be thought as leaders in these spaces, then they have to start doing this, otherwise they'll be, "as it is". It seems now as a student, industry comes to academia and says, "hey, we need these things" and they haven't even, very well, we don't even know if really these are the things that they need,……..There's this assumption that students don't have specific technical skills. When it turns out employers are looking for the soft skills. But we've, you know, we've moved towards like Science, Technology Engineering, which are great and there's a job market for it,……but you know, employers say people don't have communication skills."

Work environment, relates to the realization of the necessity to integrate uncertainty as an important driver, to have a more welcoming environment for creative thought, and input from outsiders.

"If the scenario analysis leads the way to a culture at the workplace that acknowledges uncertainty as an important driver that can't just be ignored by running with the central Trend or the "we know whatever" the actual line. …..Hopefully it would allow the university to be efficient with the resources as the future is changing. Help our researchers to be relevant to whatever future happens. You want to be at the big discussion. "

"it can have weaker culture (less restrictive) *and I don't mean weaker culture as in in a bad way. I mean weak culture as in there's a lot of opportunity for Creative thought so if so that benefit coupled with getting the more accurate information from the stakeholders, I think can be can become a useful tool but I think there has to be a collaboration across those different parties."*

Spill out, relates to how the integration of scenarios to a higher education institution can more directly contribute to stakeholders from the contextual environment. Two subthemes were identified:

Leadership, relates to the influence that a change in the process of thought and planning by the university would have on other stakeholders. This could be a path to lead the minds of the sector towards improving the strategic approach to deal with the challenges ahead.

"….academic institutions could demonstrate or lead or pave the way as a global leader, for other entities like agencies and industry, to also be thinking this way, like, we're all kind of in this community, together, caring about similar things, about dealing with natural resources. And so I think everybody benefits when there is more creative, flexible forward thinking."

"Yes, because once again if the university adopts this, all the environment within the university (and) around the University will start, will think about it, outside the box and that is going to influence not only the private sector, it is going to influence anybody around the Academia so it's not only going to have an impact to the industry or the stakeholders out there. It's going to impact the whole the world"

Improved service, means in having a better prepared higher education institution, than can provide better service, ballasted on the awareness and preparedness of its professionals to deal with TUNA elements.

The outside world definitely, as most of the new ideas come from Academia anyway, so if the Academia decided to be prepared to face new challenges that will definitely help the outside world outside of the Academia. Especially companies and NGO's.

"For the Academy, specifically for the courses for Oregon State University to support the industry, that will off course be useful. If the CoF uses this tool, maybe they can develop a scenario where they say, okay, we figured out that Global warming would be a big problem in the future, we will support entities to fight and solve the productivity that the warming would bring. But maybe also they define that is a problem we are not interested in that that is not our core business or there is no part of our strategy. We want to identify a scenario, just only involving research and academia to increase publication and things like that. So maybe they say no, we identified we will use this tool to see how the educational system which aim for now for now to 20 years, or how the research, not the applied research, just the scientific scientific research, not applied research will increase so that we get to increase the number of publications, by the professor, by the departments and the institution to get a higher rank, as a high academic institution in the forest sector."

Due to their characteristics and relevance, two other subthemes identified were allocated in both themes, Spill In and Spill out.

Inclusion, relates to two concepts: 1) the openness to the participation of diverse group of professionals in the strategic thinking processes 2) the inclusion of external stakeholders to participate in the strategic thinking processes of a higher education institution.

"Depending on how its implemented. I think if you're going to use scenario planning to for the benefit of other stakeholders essentially and those stakeholders need to be included in the conversation. Right if the university is just doing in-house scenario planning as to what they think would be beneficial for other stakeholders than you run the risk of missing part of the heart of the problem. Essentially you might not get complete information about what's important to those stakeholders and what they see is as possibilities and how they see the nature of their landscape in there in the world that they play in so to speak so it can be it certainly can be a useful tool because universities tend to be places where it's thought of that ideas can flow more readily."

"What I do think is that it's necessary that the actual sector and the school be working closer together and communicating because if the school doesn't know the sectors issues or their goals or potential problems they face then they can't really address them."

Next GEN, relates to the concept that a path to integrate TUNA elements into strategic planning processes, potentially for the whole forestry sector, is preparing the next generation of professionals with these concepts added to their experiences while in the university.

"(University comfortable with change) *certainly would spill over to students that they would come out of this and become employees that have that on their mindset and would spill over, when we deal with agencies, we would see the difference in culture and all that set up directly."*

"I mean, first of all, academia is training people that then go out into the workforce. And so it's using scenario planning to adapt better to the future, or prepare better for the future. And the people that leave with their degrees will theoretically be also more prepared for the future and better contribution to the workforce and the rest of the industry."

"Yes, like a 100% Yes. So I think our responsibility as an academic institution is to prepare students for the industries that they would be going into. If we're preparing our students knowing that the future

could be any of these variety of scenarios, and we have planned for those, then that then informs industry of what kind of employees they need, a timeline that they might need them in the technology that they might need to be able to use."

Answer 9. Can you elaborate on positives and negatives of the tool itself? (Question 4)

Question four does not apply to a significant layer, as it is a direct enquiry that seeks to collect the participants thoughts on the positives and negatives of the tool itself. The question was completely opened, giving total freedom for the participants elaborate on the aspects that they perceived while applying it.

Positives

Within the positives two themes were identified. The first and most prominent was designated as Concepts and the second theme was designated as Structure.

Concepts included phrases or perceptions of the participants that related to core concepts of scenarios, such as its premises, and contribution(s) it can provide towards the culture of an institution. Within this theme, two sub-themes were identified: Reframe & Reperceive and Diversity & Inclusion.

Reframe & Reperceive, relate to the core concepts and premises of the tool. The main points highlighted were 'think out of the box", "mindset", "think through" and "think differently".

"It really encourages or forces people to think through and formalize notions that otherwise would be marginalized or ignored. "

"Clearly the past is not always the best predictive feature. So thinking about that, the broadest set of features, everybody can benefit."

"I think all the university, companies and whatever players should do this because that can make people think outside the box and they might become clear and realistic about the future."

Diversity & Inclusion relate to values that scenarios can aggregate to outcomes of planning processes through the inclusion of participants of different levels within an institution's structure and with diverse backgrounds from within or from outside stakeholders.

"I do think a strength of it is that Even though power dynamics do exist and need to be managed for, I still felt like in the context of our conversation, like my, my perspective was just as valid as the perspective of someone who's been in it for a long time. And like they recognize that I see things differently."

"getting different stakeholders with maybe different agendas, different viewpoints on what they want the future to look like, in a (same) room. I was it was really interesting to me that the faculty, or the male faculty, were very focused on the timber industry. And the forestry school like this was a like, so goes the timber industry so goes the forestry school but as someone who is not planning to work in the timber industry, I'm not here for an education to work in the timber industry. It was interesting to see them like, Oh, these things are tied, and I can see that tie. But for students that are focused more on like

conservation, it might be better for us if it was not so tied. So to get those diverse viewpoints, and there, I think it's really valuable because you don't always get a lot of opportunity to have that kind of brainstorming about what you want the school to be. So I think that's a huge positive. When we're all immersed in our work and short term deadlines, we don't think about the future and what we want these organizations to be."

"If done right I guess, at least I've seen other studies, where it is a very good way to broaden the discussion not just within the decision-making group and staff, you can also bring in stakeholders or Outsiders and he will get their ideas into the process into the Futures, into the scenarios and also make them part of the planning process and therefore future by in, as the plans are implemented. "

Structure relates to positives that participants perceived of the mechanics of the tool.

"… using the two axes, the way that we did for those different scenarios really spurred people's thinking in ways that maybe they wouldn't have thought if we had just been asked, come up with random things, random features. So I think that that process is effective in it spring new ways of thinking."

"I really think that is important this idea of developing a future scenario and then trying to fill the Gap and things like, what can we do now to follow that way or to avoid that way whatever situation we decide."

"the series of steps that we did, starting with, I guess, thinking about the relationship between the past and the present and the future and thinking about the path to the future that we're currently on, helps set the stage for imagining different possibilities."

Negatives

Within the negatives a few themes were identified. The first and most prominent was designated as structure, followed by cost and a third theme is related to factors that have to be taken into consideration for the success of the tool.

Structure relates to and aspects of the mechanics that were identified by the participants during the workshop. A few sub-themes were identified as follows:

- Complexity of the protocol was identified as a negative aspect, due to the number of steps of the method and the requirement of more people which can add to the complexity due to more ideas and divergence.

"if you know how to play the game, you could get a lot a lot positive things out of it but if you are that kind of person that you can easily get confused enough being sure about things you want to see in the future, maybe that could be a problem."

"I didn't figured out which one is like a step by step process to the scenario planning."

The more people you have the better information you're getting but the more it can get complicated and even more time consuming so you have to have some really good group of people and also very good Proctor or person administering to keep everybody on track and focus.

"Well it's a lot of work on that."

- Collaborative exercise relates to challenges that participants perceived due to the collaborative nature the method requires.

"at times it felt really vague. And it was hard to know. It's hard to know what we were talking about or what we were doing. And I felt like each one of us in the room was on a different page and coming at it from a different angle. And we didn't necessarily take the time to, like really get on the same page about what we were doing."

"As in any type of collaborative environment, (challenge) its Keeping people focused on what you're really trying to accomplish and not letting people wander off. You also have to watch out for things like group thinking and things like that. So, the challenge and the disadvantage is that you're still dealing with people. So, all those dynamics are still going to come into play. You need to be able to minimize the impacts of those while, getting people to realize the advantages of scenario planning and try to structure how they think about participating in scenario planning so that they can pull out some of those advantages."

- Resources, relates to resources that are necessary to dedicate to such an exercise. The two main resources highlighted were cost and time.

"to really do it effectively It's a time-consuming process. Like for me, you know, spending three hours on a Friday afternoon I was like, Okay, this is taking takes a long time and is interesting, but I'm imagining like scaling that up to broader array of stakeholders and to like really go into the details of the scenario planning like it would take a long time."

"I guess it takes some skills from the whoever's running the scenario analysis. So there's some educational skill that I suspect can be expensive."

"So there is some I mean there is some real time and therefore cost associated with that and again, I'm not so sure if they are follow up cost in terms of the implementation. That would be higher than standard planning scenarios."

Moderators relate to the need to have moderation for the success of the method and the level of the preparedness of the moderator to properly fulfill the role.

"There has to be a really good moderation of scenario planning for it to be effective."

"I don't really see a whole lot of negatives Other than that, you do need somebody facilitating it pretty much the whole time to make sure that it actually rolls forward in an appropriate manner. Without that facilitator, I think we probably would have gotten in the weeds multiple times."

Challenges, these could be identified as necessary conditions that can pose a challenge to achieve positive results. This theme was defined by a collection of different aspects: bias, buy-in, behavioral rules and diversity of the participants.

- Bias, relates to that people willing to participate are, potentially, more prone to change resulting in the lack of inputs from other important sources.

"For some people will be, well the people that probably should be really taking advantage of his will be more reluctant to participate and commit to that and I suspect the people that you know, that are excited about it are already thinking in different terms."

- Buy in, relates to the need of support from upper management for such an exercise take place and from other members of an organization to be successful.

"You need to have buy-in from more than the decision-makers by the onto the implementers down the line and stuff. So there is quite a commitment to make from within the outfit and I brought a setting around the outfit.

"the negative would be you've got to have the right people in the room. And you got to have the right, you know, getting people into the right mindset is can be challenging."

- Behavioral rules, relate to the need to establish clear ground rules for the success of the exercise.

"I can see the potential issue that few more outspoken people can drive the process in one direction. I guess like any time you have a meeting. So it takes some careful monitoring or keeping people on task and making sure that everybody, you know, get sufficient time to provide their input and let the input gets valued adequately."

- Diversity relate to the need to have diversity of backgrounds participating, to obtain better results from the tool.

"The tool would work better. If you have a more diverse group of people involved that interact. probably I guess what adequately versus having just the very homogeneous group that has been working together and has similar background experience and interests."

Answer 10. If there was a board to develop scenarios for your institution would you be interested in participating? (Question 5)

Question five, reassess the participants perception at a personal level, layer one. The goal was to have them reassess their interest in the tool and participate in other opportunities within their institution, after having developed on positives and the negatives of the tool.

Ten of the eleven responses were positive in saying they would participate in if such board within their institution came to be. Among these, the participants were wiling to participate or if a condition was necessary to exist, towards their agreement in participating is such a board. The conditions were three: payment, time and commitment.

“If I got paid? Yeah, I just think its worth while, but its very time consuming. And to get everybody, and the more people you have to be involved in this process, I think the better the outcomes are but it also makes the actual process a lot more difficult.”

“I think for the college, I think it would, again, it comes down to the time. I believe, to do this right, you would need a significant time investment. So that would, that's what makes me hesitate to commit and do it right. But for the college, and certainly for the department to be on an advisory board that was deciding, looking into the future and charting the course, that would very interesting.”

“Yes, If well, if I see a real commitment. which and not just a token effort on that and of course I have to admit I am partially interested, for the institution, but intellectually more so to go through the process. I really enjoyed doing that, thinking of obviously as you notice thinking about what I do in the future with my own activities there. I think it's a very eye-opening experience to see what other people came up with that and stuff.”

The positives could also be organized according to “intensity” of the intention or interest to participate, varying from: yes, if it was paid, up to: yes, and I want to apply it in my work.

“Yeah. Strictly out of like the entertainment value, I would, which is probably not what you're looking for. But I do like the idea of coming up with these new ways to address things are just different than the model we're using right now, which is basically to freak out when something happens, and then try and fix it, rather than like anticipating something or the potential of something happening and having something in place to address it.”

“Yes, and the reason being is because I am on the, I'm on the upper management staff of the company and so, because I do so I have a voice in the direction of the company. So yes, I'd want to be on there.”

“Definitely. Yes, I would. And after this a scenario, and in that I actually thank you for inviting me or giving me the opportunity to participate. Because after this scenario, I'm thinking about doing things similar to this and using the same tool when I get back to my country and because I used to teach people sometimes like in Community Development and things like that. And I think this is, this will be a great tool to use with them to make them think outside the box.”

One reply was neither positive or negative as the respondent stated and reaffirmed that only professionals at higher levels within an organization should participate, position that the respondent did not have.

“I don't think I have no right level in the organization to do that. I think you need people more, more senior more and leadership positions.”