

AN ABSTRACT OF THE THESIS OF

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Innovation is a critical component for long term success of an organization. However, being innovative is rarely easy. Successful implementation of any innovation (product, process, or business system) can heavily rely on the functionality of the current innovation system in a given industry. An innovation system is composed of policies, companies, individuals, and other major actors that may play a role in the development and diffusion of an innovation into the marketplace. Historically, the forest products industry has faced numerous challenges in remaining innovative: outside forces provide few incentives or favorable policies while poor communication among industry sectors impedes creative growth from within. An in-depth analysis of why the forest sector innovation system is not performing at a higher level is therefore essential.

This thesis outlines results gathered from personal interviews with industry professionals and an industry survey on key policies, incentives, organizations, and the condition of Oregon's forest sector innovation system in general. Ultimately, the research provides recommendations for an improved forest sector innovation system that

can, in turn, increase competitiveness and synergies among forest sector companies, higher education, and other businesses in Oregon.

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Oregon's Forest Sector Innovation System: An Investigation Towards Advanced
Performance

by
Nadine C. Orozco

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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.

Nadine C. Orozco, Author

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Oregon's Forest Sector Innovation System: An Investigation Towards Advanced Performance

Introduction

Innovation is generally defined as the method of creating a product, process, supply, market, or business system that is perceived as new to an individual (Rogers 1995, Fagerberg 2005). It is commonly used as a means of gaining a competitive advantage, and is therefore recognized as a critical component in the long-term success of an organization (O'Shea and McBain 1999, John 1999). However, being innovative is seldom an easy task. Successful development and implementation of any innovation (product, process, or business system) can heavily rely on the functionality of the current innovation system in a given industry (Edquist, 2001). An innovation system (IS) is composed of policies, companies, individuals, and other major actors that may have an effect on the development and diffusion of an innovation into the marketplace (Edquist, 1997). In other words, it is a collective system of distinct actors and institutions whose innovative success is determined through their combined interactions (Kubeczko et al. 2006, Rametsteiner and Weiss 2006). While innovation systems have been a major topic of interest in academia, resulting in numerous research studies and publications, literature on innovation systems specific to the forest sector is rather scant (Knowles et al. 2008, Rametsteiner and Weiss 2006).

Comparable innovation system studies from Europe suggest the existing IS in the forest industry lacks sufficient support to promote innovation; outside forces provide few incentives or favorable policies and poor communication among industry sectors impedes creative growth from within (Kubeczko et al. 2006, Rametsteiner and Weiss 2006). The industry has historically faced numerous challenges in remaining innovative. Due to the overall change-resistant culture, the most prevalent challenge remains the dominant production orientation (Hansen et al., 2007); a tendency to focus on producing as much product as possible. Recently, upper management has acknowledged a shift in the nature of the industry (Hansen et al., 2007) where future success is contingent upon new products, processes, and the use of new raw materials (Blackman, 1998). Given the connection between financial performance and new product development (NPD) (Han et al. 1998, Hurley and Hult 1998), it has become critical that forest sector manufacturers increase their innovativeness. Thus, modification of the corporate culture is necessary for the forest sector to effectively adopt and implement these essential tools (Hansen et al., 2007).

The first step to stimulating a change in the corporate culture of the forest sector would be to identify all major players in the IS. Accordingly, this work aims to identify key policies, incentives, organizations, and other major players in order to better understand the communication and information flows within the IS of Oregon's forest sector. Essentially, as an accessible resource, this inventory can be used as a tool to educate companies regarding opportunities for improved innovation; and in theory, this improved

awareness among wood products manufacturers will help to increase the industry's competitiveness and synergies among forest sector actors, higher education, and other Oregon business sectors. This identification and awareness is an important first step in enhancing the IS. Van Horne (2006) states "by improving the understanding of the concept of value creation from innovative knowledge, centers of expertise can develop . . . better tools to transfer knowledge so that it is used to create value for the forest products industry". The methods and findings of this project can serve as a model for other states as they work to increase the competitiveness of their forest sectors.

Objectives

This study presents a description of the current IS in Oregon's forest sector and provides recommendations for improvement upon this system.

Specific objectives of this study are:

- 1.) Identify key public and private organizations involved with Oregon's forest sector IS, as well as other major actors.
- 2.) Identify major local, state, and federal policies and incentives related to innovation available to Oregon's forest sector manufacturers.
- 3.) Clarify the roles and responsibilities of key organizations, policies and incentives in Oregon's forest sector IS.
- 4.) Identify prime opportunities and barriers to increasing innovation in the manufacturing sector, and develop recommendations for overcoming these barriers.

Theoretical Background

Innovation and Innovativeness

Making the distinction between innovation and innovativeness is necessary as they are quite different. Innovation, as previously stated, can be defined as the new combination of existing resources to create an idea, practice, or object that is perceived as new to an individual (Rogers 1995, Fagerberg 2005, Damanpour 1996, O'Shea and McBain 1999, Johnes 1999, Hult et al. 2004). Innovativeness is a firm's inclination to engage in innovation (Wolfe 1994, Hult et al. 2004, Hovgaard and Hansen 2004). So, an innovation can be thought of as the output of innovativeness; innovation is the end result, and innovativeness is the propensity to innovate. Further, innovativeness can be a derivative of organizational culture, and culture therefore can play a large part in a firm's ability to produce innovations.

There are several drivers of innovation, one major driver being technological advances. Technology and increased global communication has had a major effect on consumer demands; they are changing just as quickly as technology (Cooper, 2001). Further, because consumer demands are evolving so rapidly the average life cycle of a product is decreasing (Cooper, 1996).

As described by Metcalfe (1998), innovation is crucial for economic growth as it introduces a wide range of product variety; if this should cease to exist the economy

would reach a “stationary state” with little to no growth. Now more than ever, the industrial US is recognizing the need to innovate (Bullard and West 2002, FPAC 2007, Andrew et al. 2007). As innovativeness is on the rise (Cooper, 2001), the type of innovation is also being further specified depending on the industry and product or service type. In general, innovations can be categorized into three different groups: product, process, or business systems innovations (Hovgaard and Hansen 2004, Hansen et al. 2007).

Product Innovation

In simplest terms, a product innovation is the development of a good or service that is perceived as new. Innovation is often classified into two categories, radical or incremental. A radical product innovation would be the development of an entirely new product, the first of its kind. A wood I-joist would be an example of a radical product innovation within the forest products industry as it was the very first product of its kind. Radical product innovations make up only approximately 10% of all new products (Cooper, 2001). An incremental product innovation would be an addition to or improvement upon an existing product (Hart 1996, Johne 1999, Lundvall 1992, Van Horne et al. 2006). Another radical product innovation that paved the way for several incremental innovations would be plywood. Incremental innovations following plywood could be for example, laminated veneer lumber and oriented strand board. Given the marketing that customarily accompanies the release of a new product into the market,

product innovations are arguably the most recognized type of innovation. Further, and due to the vast body of end users, Hart (1996) says “product innovations provide the most obvious means for generating revenue”, and continues on to emphasize the importance of NPD in the long term growth and success of a business.

NPD and product innovation, although similar, are not the same. NPD is the entire process from formulation of an idea to turning that idea into a reality; product innovation is one phase in this process. When simplified, NPD can be summarized into six steps: 1) identifying a problem (discovery), 2) doing the research (scoping), 3) developing a solution (business plan), 4) product innovation (development), 5) validation (testing), and 6) reveal (launch) (Cooper. 2001, Van Horne et al. 2006). Successful NPD is an interactive and educational experience; Cooper’s (2001) Stage-Gate Model relays this. Cooper’s (2001) widely accepted Stage-Gate Model of NPD includes checkpoints between developmental phases. These gates or checkpoints serve as a quality control facet and provide the manufacturer with the opportunity to review and potentially “kill” a product before moving on to the next developmental phase (Figure 1). The pause in development serves as a filter to help ensure that resources are only being used on worthy products, and only the best products are making it all the way to market.

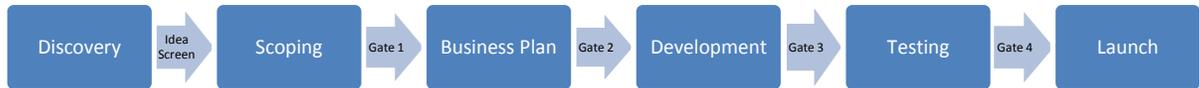


Figure 1: Stage-Gate Model of NPD (Cooper, 2001)

Process Innovation

Process innovation, as the name suggests, focuses on the process of manufacturing a product. This manufacturing process can be a completely new (radical) method of production, or it can be an adjustment to an existing system (incremental) in which the end result is improved efficiency (Damanpour et al. 1989, Cumming 1998). While it seems instinctual that individuals/companies strive to achieve efficiency in all activities, the ability to identify redundancies and realize a solution is becoming an increasingly valuable skill in the work place. The development and popularity of lean manufacturing is one good example of this increasingly valuable skill. Lean manufacturing “seeks to create value and eliminate waste in all business processes” (Supply Chain Management Review, 2005). Process innovation is utilized as a means of minimizing production costs, creating a competitive advantage, and achieving lower prices for the consumer (Johns, 1999). Globalization has increased the likelihood that a single product has assembly points around the world, and process innovation can therefore be complicated to achieve. In this instance it is of particular importance to communicate with all suppliers in the manufacturing process in order to get the best understanding of current practices and

attain the in-depth knowledge that is required to coordinate a successful process innovation (Lundvall, 1992).

Traditionally, in the general public, radical process innovation has been accompanied by major economic change. For example, Henry Ford's assembly line innovation was one of many that contributed to the industrial revolution and the economic boom that accompanied it. Often organizations don't recognize the potential simple adjustments could have on manufacturing costs, and this oversight could result in unnecessary losses. Ford's process innovation significantly increased efficiency, output, and economies of scale (Freeman 1982, Mowery and Rosenburg 1993) and today "Fordism" is referred to as a manufacturing process that seeks to minimize costs and maximize profits through standardization. Process innovation within the forest sector is a common practice, but is not necessarily accompanied by major changes in society. As a large portion of the forest products industry is manufacturing based focused on increasing production efficiency, process innovation is the dominant type of innovation in the forest sector. A few examples of process innovations within the sector including: automated scanning, grading, sorting, stacking and overall optimization.

Business Systems Innovation

Business systems innovation has been described as a change or development in organizational structure that better enables innovativeness (Damanpour 1991, Damanpour

1996, Wolfe 1994, Hansen and Bull 2010, Hovgaard and Hansen 2004). Despite numerous studies that have attempted to identify the key organizational factors that enhance innovativeness, consistent results have yet to be produced (Barczak et al. 2009). It appears that there is no one ideal organizational structure to encourage innovativeness, but rather the structure is case dependant (Kelley, 2009). There are however some general suggestions that can be used in developing an organization to be more innovative. The main suggestions are to “develop feedback mechanisms and to maintain sufficient flexibility to change and adapt” (Kelley, 2009).

Although a consistent identification of organizational factors that will enhance innovativeness has not been produced, identification of factors that influence the facilitation of innovativeness has. These key factors that may hinder or enhance innovativeness include: individual influence, environmental orientation, employee connectedness, and even company culture (Hansen and Bull 2010, Wolfe 1994). Further, management and marketing techniques were considered to be the two most influential organizational factors on innovativeness (Wolfe 1994, Hovgaard and Hansen 2004). Therefore, a business systems innovation will most likely consist “of the introduction and integration of new management systems, marketing methods, administrative processes, or staff development programs” (Crespell et al., 2006).

Highly Integrated

It is important to understand that while these three types of innovation are very different from each other, they are also highly integrated. One type of innovation, for example a new product innovation, may also require a process innovation to produce that new product, and a business system innovation may be necessary to manage the significant changes in business practices. The strategy of mass customization provides a good example of how these three types of innovation can be very interrelated. “Mass customization, is the fulfillment of orders at costs and lead times that communicate value rather than penalize for personalization or order size” (Kodzi and Gazo, 2006). An example of this would be, providing customers with a website that allows them to customize the types of cabinets they would like to purchase while maintaining a quick production time and low cost. So, mass customization could initially be considered a process innovation, as it directly affects the manufacturing practices of an organization. However, it could also easily be considered a product innovation as the result is a personalized or unique product for a given customer. Lastly, the management efforts will also likely need to adjust to the new business practices and may call for a business system innovation.

Clusters

Business clustering is a model that helps foster company and industry innovativeness. In a highly globalized world where the transfer of goods, services and information are on the rise, it may be difficult to recognize how a company’s physical location can have any significant influence on its competitiveness. However, as described by Porter (1998)

“what happens inside companies is important, but clusters reveal that the immediate business environment outside companies plays a vital role as well”. An industry cluster can be described as geographic concentrations of industry related businesses that actively cooperate with, as well as compete against each other, in which the result is increased industry competitiveness (Aguilar et al. 2009, Porter 1998).

A successful industry cluster encompasses a wide array of entities important for competitiveness. A few obvious inclusions in a successful cluster are the suppliers of the specialized machinery, services, and/or infrastructure that are necessary to carry out business. Next, however, a cluster should expand laterally to include related industries with complementary “. . . products, skills, technologies, or common inputs. Finally, many clusters also include governmental and other institutions - such as universities, standards-setting agencies, think tanks, vocational training providers, and trade associations – that provide specialized training, education, information, research, and technical support” (Porter, 1998). Through combined efforts the organizations involved in the cluster can create a new capacity for innovativeness that would otherwise be impossible; this realized competitive advantage can and should theoretically lead to enhanced productivity (Porter 1998, Hovee 2005, Aguilar et al. 2009).

There are several classic examples of successful industry clusters from around the world ranging from the high-performance auto cluster of Germany, the fashion shoe cluster of Italy to the California wine cluster. Clusters can help to increase competitiveness in three

basic ways: 1) the close proximity of your supply chain resources allows for more personal interaction which can lead to a higher level of trust, cooperation, and productivity, 2) this proximity also amplifies rivalry amongst competing companies and can motivate management to “outdo one another” which sets the pace for innovation and growth standards, and 3) an established cluster attracts new business because it offers low barriers to entry and this expansion in turn strengthens the cluster itself (Porter, 1998). In conclusion of this description it becomes clear how clusters can simultaneously enable cooperation and competition.

There are two common types of business clusters, the Hub and Spoke model and the Satellite Platform model (Hovee, 2005). The Hub and Spoke model is focused around a large locally headquartered firm with numerous other small locally participating firms. If depicted graphically the large headquarters would resemble the hub with its outward connections to the smaller local firms resembling the spokes. An example of the Hub and Spoke business cluster could be Menards. Menards is a home improvement store headquartered (hub) in Eau Claire Wisconsin. While there is some demand outside of the local area a majority of the customer demand remains in the Midwest. In response to this demand there are several small local vendors (spokes). The Satellite Platform model is less centralized and has numerous connections to local as well as non-local branches (Hovee, 2005). An example of a Satellite Platform business cluster could be Home Depot. “The Home Depot is the world's largest home improvement specialty retailer, with more than 2,200 retail stores in the United States (including Puerto Rico, the U.S.

Virgin Islands and the territory of Guam), Canada, Mexico and China” (homedepot.com, 2012). As compared to Menards, Home Depot is much less centralized with several local and non-local branches.

Oregon’s forest industry traditionally followed the Hub and Spoke model but as the number of non-local customers and suppliers continues to increase, the industry is transitioning to more of a Satellite Platform model (Hovee, 2005). “Raw log supplies are sourced from increasingly distant points – Washington State, Canada and Chile . . . [and] suppliers of equipment have transitioned from in-state to global manufacturers” (Hovee, 2005). Figure 2 is a depiction of Oregon’s current forest cluster (Hansen, 2004). This conceptual model is divided into three sections: the core forest industry, core industry organizations, and forest cluster participants. Beginning from the center, the core forest industry includes what is known as the traditional forest sector revealing a complete supply chain from forests and manufacturers to the end consumer. Encompassing this core are grading agencies and trade associations whose typical functions deal directly with the core forest industry. Lastly, the outer ring of forest cluster participants includes entities that may have a connection to the core forest industry but those relations do not make up the dominant portion of their business activity. All together this Conceptual Model of Oregon’s Forest Sector is a useful tool in explaining and understanding the interactions within the business cluster.

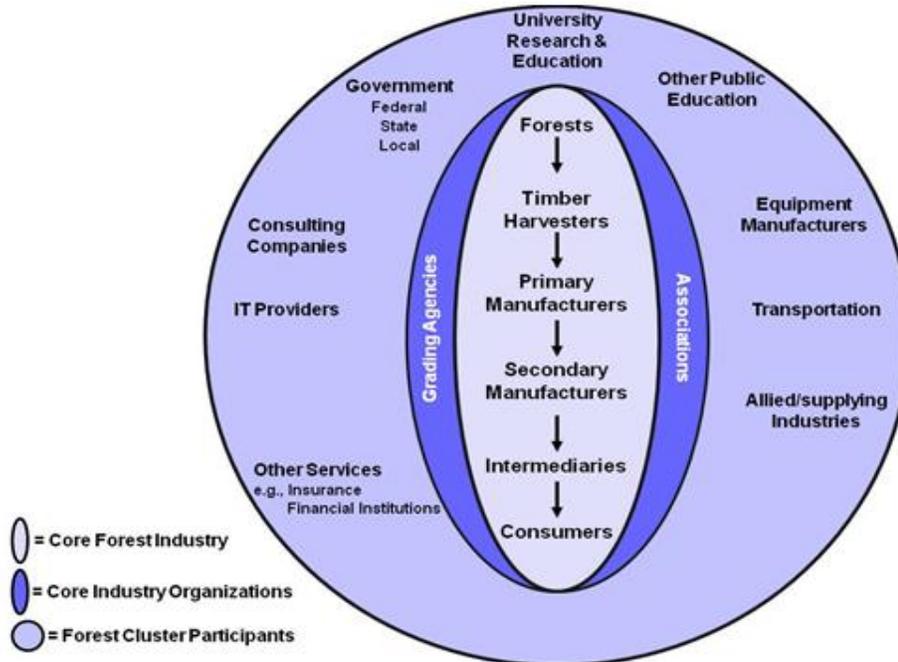


Figure 2: The Conceptual Model of Oregon's Forest Sector (Hansen, 2004)

Innovation Systems

As presented above, a central finding in the innovation literature is that a firm can rarely claim sole innovative success; more often success is dependent on the extensive interactions within the immediate business environment (Fagerberg 2005, Edquist 2005). In other words, innovation is a team sport. Various concepts, for example business clusters, have been introduced to enhance our understanding of this proximity phenomenon (Fagerberg, 2005), perhaps most detailed of which is the concept of the “innovation system”. Innovation systems are yet another way to classify cooperating business industries.

Innovation System Defined

As defined by Carlsson (2002) a “system” is an organized procedure, or a group of interacting bodies under the influence of related forces. Combining this system idea with the innovative process results in an outcome that is comparable to what we know as a support system. For most individuals their support system is composed of financial support, family, friends, shelter, etc.; and the functionality of that support system can directly influence individual development and overall success. In this sense an Innovation System (IS) is very much like a support system. The functionality of an IS can also directly influence the development and implementation of an innovation into the market place. Also, like an individual support system, an IS is composed of more than only individuals. For example, an IS can include, but is not limited to, influential companies, government policies, research centers, universities, and key individuals (Malerba 2002, Fagerberg 2005, Edquist 2005, Lundvall 1992, Nelson 1993). In more technical terms, an IS is a complex web of interconnected actors whose actions are guided and restrained by the dominant culture, and whose success is determined both by individual as well as collective performance (Rametsteiner and Weiss 2006, Edquist 2005). A main descriptor of an IS is that interactions and relations pertaining to innovativeness are maintained over an extended period of time, not just for one specific innovation project (Rametsteiner and Weiss, 2006).

Emergence of the Innovation System

Innovation has been described as “inherently human” (Fagerberg, 2005) as it is instinctual to search for new and more efficient products or processes. For this reason, the innovation process is arguably as old as mankind itself (Edquist 2005, Fagerberg 2005). However, a true academic curiosity on the subject did not emerge until the mid twentieth century. This shift in interest was quantitatively identified by the significant increase in the number of publications with the word “innovation” in the title (Fagerberg, 2005). At this time scholars began to critically analyze the function and importance of innovation, and attempt to identify it by its systemic nature (Edquist, 2005). In fact, the first time the expression “national system of innovation” appeared in publication form was in Christopher Freeman’s 1987 article *Technology Policy and Economic Performance* (Edquist 2005, Liu and White 2001). Therefore, even though the innovation process has theoretically always taken place, it wasn’t until more recently that the concept of the innovation system took shape.

Innovation System Boundaries

Innovation Systems are commonly classified into three categories: Sectoral Innovation System (SIS), Regional Innovation System (RIS), and National Innovation System (NIS) (Freeman 2002, Nelson 1993, Malerba 2002, Edquist 2005). All three classifications are based on their area of influence. A SIS is sector specific, for example the athletic apparel sector. This is one sector of the apparel industry, and it tends to be more innovative than other sectors simply because of the nature of the product. Based on a more territorial

concept the RIS focuses on one area or region, for example the Silicon Valley. This region is known for its high-tech innovation and development in general, not necessarily specific to one industry or sector. Lastly, a NIS focuses on the system across an entire country (Breschi and Malerba 1997, Kubeczko et al. 2006, Edquist 2005, Lundvall 1992, Nelson 1993). The United States, specifically during the industrial revolution, would be a great example of a NIS. This study analyzes a SIS as the focus is on the forestry sector. However, because the area of observation is confined to the state of Oregon there is also a territorial dimension.

Functions of the Innovation System

At the most basic level, the purpose of an innovation system is to create, implement and utilize innovations (Edquist 2005, Johnson and Jacobsson 2003, Brege et al. 2005, Kubeczko et al. 2006). Kubeczko et al. (2006) provided a graphical representation of these three basic functions within an innovation system (Figure 3). In this depiction, Kubeczko et. al (2006) refer to the creation function as the 'Provision of Resources', the implementation as 'Management of Complexity', and diffusion as the 'Promotion of Use'. Outside forces, such as industry culture and policy, can be just as influential as internal forces on the performance of this system. Further, while being innovative is systemic in nature, these functions of an innovation system can be thought of as a progression. For example, an organization wouldn't implement an innovation until it has been created, and an organization wouldn't diffuse an innovation into the marketplace

until it has first been created and implemented. So, these three functions can be labeled as: first – create, second – implement, and third – diffuse.

Function 1: Creation

Creating an innovation is the first step to kick starting this system, and in order to create there are three crucial inputs required. The three necessary inputs are financial, human and knowledge resources. The required financial resources can be found from within an organization initially, and if internal resources fall short can also be found in the form of loans, government incentives, grants, etc. The human resource input refers to having or acquiring skilled personnel. An organization may already have the skilled personnel needed to deal with the innovative product or process, but there is also a high probability that new employees with different skill sets or simply more employees to help tackle an increased work load are needed. If the current body of employees does not suffice, additions may be found in the market place in the form of new hires. The last required input is the knowledge resource. An internal knowledge resource could be something as simple as having an educated staff, or as advanced as having a research and development team. When more knowledge/information is needed an organization can look to academia, research centers, or online. The acquisition of human and knowledge resources are interrelated as human resources may provide labor, or knowledge, or both. Once these three inputs are sufficiently provided innovative creation and development is easier to achieve.

Function 2: Implementation

After creation it is the primary job of upper management to handle the complexities of transitioning the innovation into daily work routines. In practice this means dealing with any conflicts that may arise. If the implementation is limited to a single firm, management may make institutional changes to rules and regulations to better suit the new work environment. If the implementation involves multiple firms, the potential complexity and conflicts can significantly increase. Further, interfirm implementation may require more than institutional changes for example, interfirm strategic planning and cooperation.

Function 3: Diffusion

Once an organization has successfully created and fully implemented the innovation into the organization it can move on to diffusing that innovation into the market place. If the type of innovation was an improved manufacturing process, then it is most likely that an organization will not try to sell that technology to an individual consumer, but will either keep that technology within the firm or perhaps spread that technology throughout the industry. If, however, the innovation type was a product or service, then the marketing strategies and even laws and regulations will have a significant influence on the overall success of that innovation in the market place.

Outside Forces: Culture and Policy

While these three organizational functions clearly have a role in the overall success of an innovation system, there are external forces that are equally important. These outside forces have been identified as industry culture and policy (Edquist 2005, Johnson and Jacobsson 2003, Brege et al. 2005, Kubeczko et al. 2006). Both culture and policy can influence all three of the above functions. For example, policy can have a direct hand in providing monetary resources in the form of loan programs, grants and other incentives to help firms meet their financial needs. Further, policy can restrict use of specified materials, for example any number of illegal products. Culture, on the other hand, can influence the entire business environment. An industry culture can have a major effect on the management style, level of cooperation and communication between firms, willingness to take risk or “create”, adaptability, and acceptance of a new product or technology.

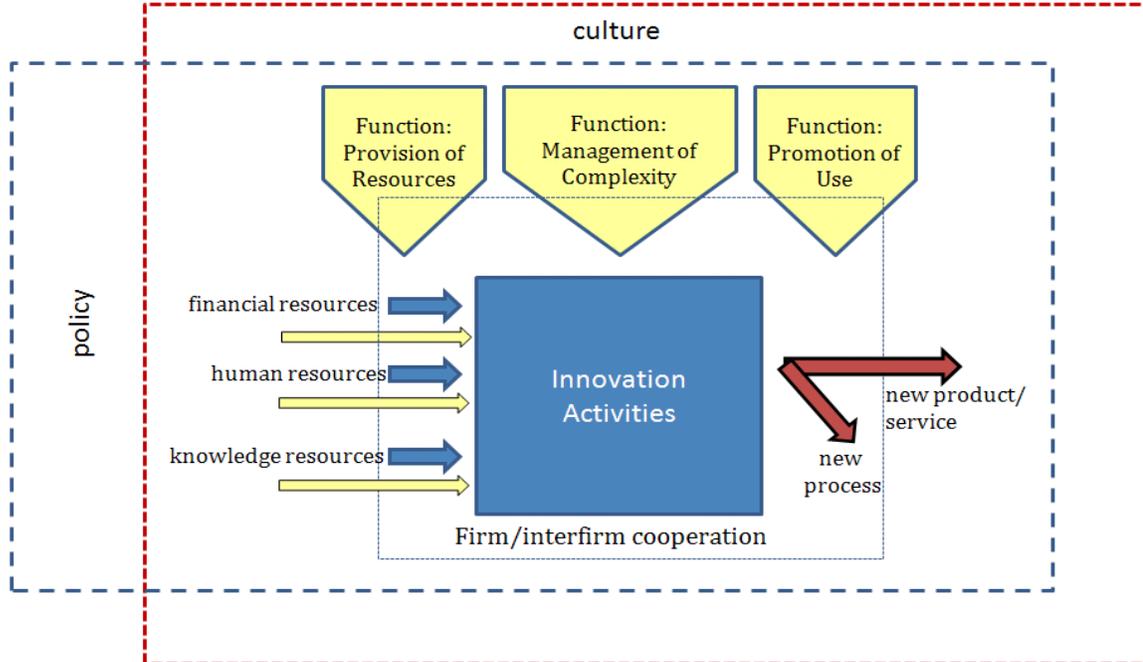


Figure 3: Conceptual Model of an Innovation System (Kubeczko et al., 2006)

Supporting the Innovation System

In response to the question “how can you support an innovation system”, Etzkowitz and Leydesdorff (2000) developed the triple helix model. The triple helix model is composed of three different subsystems: business, social and political. The business subsystem refers to the industry makeup and its focus is on the overall culture of the industry and formation of markets to absorb the innovative output. The social subsystem refers to increasing education, knowledge and research through collaborations. Finally, the political subsystem refers to governmental support in the form of policies and or incentives that can help encourage both the business and social systems.

Innovation Policy

Innovation policy is a tribute to the significance of innovation to industry competitiveness and overall economic growth (Weiss 2011, Rothwell and Zegveld 1981). In practice, innovation policy can be thought of as a means to induce and support innovation (Weiss 2011, Rothwell and Zegveld 1981). While this goal may appear relatively simple to achieve, there are several difficulties that policy makers face during formation of a new policy. A few of these difficulties include: having several government departments responsible for the development and implementation of the same policy, an often incomplete understanding of the implications a new policy may have on the economy as a whole, and including too many (or too few) industry professionals in the decision making process (Rothwell and Zegveld, 1981). Traditional innovation policy acknowledged innovation as a linear process and therefore focused mainly on financing research and development activities. Recognition that innovation is a systemic rather than linear process has spurred policy makers to address framework conditions, such as information transfer and industry interaction, rather than only monetary support (Weiss, 2011). As our understanding of innovation is still developing, so is our understanding of innovation policy, and consequently which approaches may be most effective in promotion (Weiss, 2011).

Forest Sector Innovation System

A better understanding of the forest sector innovation system is important for two simple reasons. First and foremost, innovation is as relevant to the forest industry as in any other

industry today that is dealing with an increasing number of international competitors and other effects of globalization (Weiss, 2011). Secondly, the forest sector, in particular, contributes to sustainable development through the use of renewable materials, carbon sequestration, and providing a range of ecosystem services (Weiss, 2011); all of which are becoming increasingly important to modern consumers.

The “Traditional Sector”

The forest industry has been labeled by Breschi and Malerba (1997) as a “traditional sector”. According to Breschi and Malerba the traditional sector can be identified by several factors. In regards to innovation, a traditional sector is one that has limited opportunities; these opportunities are mainly related to lowering production costs, and require the ability to effectively incorporate new knowledge into existing products or processes. Knowledge and information transfer in a traditional sector is relatively simple and is often in regards to equipment and materials. Finally, the key players along the supply chain form interdependent relationships with each other and with other public agencies.

Impeding Factors

The forest sector has, to a large extent, maintained the same organizational structure since the nineteenth century (Brege at al., 2005) and because of this has also retained a dominant production orientation and a focus on process innovations (Kubeczko et al., 2006). Further, the change resistant culture poses several impeding factors for the

reconstruction to a more successful IS (Hansen et al., 2007). Limited information suggests that the main factors prohibiting development of the forestry SIS include: a lack of vertical cooperation and communication within the industry, the cost and risk involved with innovative practices, and employee attitudes and qualifications when faced with new ideas or practices (Rametsteiner and Weiss, 2006).

1. Cooperation and Communication

The first step to increasing cooperation and communication within the industry is to identify all its major players. Identification and a better understanding of all the major players in an innovation system will help to increase awareness, even amongst themselves. Presently no one has attempted to identify the major players of Oregon's forest SIS, and for the most part these major players are unaware of each other. This lack of awareness is a key impeding element as it hinders the distribution of information on current innovative activities between companies, research centers, and universities (Rametsteiner and Weiss, 2006).

2. Cost and Risk

As resources in time, money, technology, and personnel are often limited, taking on innovative practices can pose an extreme financial risk. Yet adequate resources are another essential success factor (Cooper, 1996) to reshaping Oregon's Forest SIS. Up-front research and development is one way to better utilize resources. A study by Cooper (1996) found that "up-front homework and sharp early product definition . . . results in higher success rates and profitability." Ironically, this crucial first step is often overlooked and underfunded; more often

the majority of time and money is dedicated to the end stages of development.

This lack of initial focus and project evaluation often results in poor new product performance (Boer and During 2001, Carlsson et al. 2002). The main risks involve poor utilization of time, money and personnel and as a result, low return on investment.

3. *Adaptive Abilities and Company Culture*

Lastly, a company's adaptive abilities can play an important role in the level of innovativeness that they are able to achieve (Cooper 1996, Bull 2006, Hansen et al. 2007, Boer 2001). The adaptive ability of a business is a determinant of innovativeness as they will need to be able to learn from "success as well as failure, to identify and correct mistakes, . . . read and interpret market signals and take appropriate actions, and to diffuse technology throughout the system" (Carlsson et al. 2002). Learning orientation, knowledge, and company culture are three interrelated factors that help to determine adaptive ability. Learning orientation has to do with the development and use of new knowledge and can be described as a business's level of open mindedness (Bull 2006, Hult et al. 2004, Calantone et al. 2002). A company's learning orientation will influence where and what kind of information is gathered and how it is "interpreted, evaluated, and shared" (Calantone et al., 2002). Knowledge can be classified into two categories, tacit or explicit. Tacit knowledge is not easily written down but better relayed through personal interactions, while explicit knowledge can be a list of instructions or directions (Bull, 2006). "Both collective learning and knowledge

are two aspects of the wider learning concept of organizational culture” (Bull, 2006). As previously stated, the general culture of the forest products industry is resistant to change which, and as clarified above, can mean a more narrow minded outlook, poor knowledge transfer within an organization, and an overall low adaptive ability.

Potential Supporting Factors

These impeding factors are recognized within the industry and as a result several organizations have made strides towards altering the traditional environment that has for so long enabled the anti-innovative behavior. Along with successful examples from the Canadian government, these organizations provide Oregon’s forest sector with the strong leadership needed to implement lasting change.

1. Oregon Department of Forestry

The Oregon Department of Forestry (ODF), along with all the other support it provides to the forest sector, has recently organized and hosts the Forest Cluster Working Group. This group is composed of twenty-four representatives from industry, academia, and government working together “to provide unfiltered recommendations on how state government can best assist the sector to remain viable and globally competitive” (ODF, 2012). In order to achieve this goal the Forest Cluster Working Group has revealed an “Oregon Forest Cluster Economic Development Strategy”, essentially a written report of their recommendations that can be easily shared with individuals in the industry cluster (ODF, 2012). The

Oregon Forest Cluster Economic Development Strategy outlines three main priorities along with strategy recommendations, and immediate actions needed for each priority. The three priorities include: 1) Federal Forest Restoration, 2) Forest Cluster Vitality, and 3) the Forestry Workforce (ODF, 2012). The Forest Cluster Working Group plays a key role in providing guidance and thoughtful development strategies to enhancing Oregon's forest sector.

2. Oregon Forest Resources Institute

Developed in 1991, the Oregon Forest Resources Institute (OFRI) was created to enhance communication and collaboration throughout the forest industry cluster, and to act as an informational resource regarding responsible and environmental forest practices (OFRI, 2012). In 2005 Hovee & Company released the "Oregon Forest Cluster Analysis" prepared for the Oregon Forest Resources Institute. This report provided an exhaustive description of the state of Oregon's forest cluster and gave detailed recommendations for improving the sector. Hovee et. al (2005) focuses on areas such as market leadership, return on investment via strategic management, biomass conversion, wood innovation, nanotechnology, green building, and the benefits of industry clusters as the main areas that need improvement in the industry. Further, the author provides several examples from different countries, mainly Scandinavian countries, where these areas of interest are thriving and can potentially be used as models for implementation in Oregon's forest sector. This analysis validated the significance of the forest products

industry for Oregon's economy and in turn helped to redirect some of the surrounding policy.

3. Oregon Wood Innovation Center

The Oregon Wood Innovation Center (OWIC) is a creation of Oregon State University's College of Forestry and Extension Services with the mission of improving competitiveness in "Oregon's wood products industry by fostering innovation in products, processes, and business systems" (OWIC, 2012). OWIC serves as a critical link between academia and industry. More specifically, OWIC provides industry companies with access to OSU's mechanical testing equipment, the opportunity to hire student interns, technical support during new product development, and can provide answers to product performance issues. Further, OWIC maintains an up to date online industry directory. As networking, communication and collaboration are key aspects in an IS, this directory helps foster innovation by providing industry professionals with valuable contact information to each other. Lastly, the Oregon Wood Innovation Center sends out quarterly newsletters to its members with updates about industry news, student stories, and educational opportunities.

4. Looking to our Neighbor

Recently one Canadian province has demonstrated the importance of providing government support and enhancing its forest sector. On April 12th, 2012 the provincial government of British Columbia (BC) released the report "Our Natural

Advantage: Forest Sector Strategy for British Columbia”. The focus of the report is on increasing employment in the forest sector as the industry plays a huge role in overall economic vitality; also the case within the state of Oregon. John Allen, Council of Forest Industries President and CEO, has said the specific strategies of the report “build on our reputation for sustainability, and encourage competitiveness, investment and innovation – which are key to building the sector” (ForestIndustry, 2012). The report closely followed the recommended priorities as identified by the Working Roundtable on Forestry, a segment of the Ministry of Forests, Land and Natural Resources Operations (BC Gov., 2012). The six identified priorities include: “1) a commitment to using wood first, 2) growing trees, sequestering carbon, and ensuring that land is available from which to derive a range of forest products, 3) creating a globally competitive, market-based operating climate, 4) embracing innovation and diversification, 5) supporting prosperous rural forest economies, and 6) first nations becoming partners in forestry” (Our Natural Advantage, 2012). The proactive approach taken by the BC government has provided Oregon and the United States with an opportunity to follow their lead in prioritizing the forest sector, and has further provided a model that may soon prove to be successful.

How It All Relates

So what does all this mean, and how does it relate to the study objectives. Simply put, innovation is a critical component to maintaining industry vitality and Oregon’s forest

sector innovation system is not performing well. Therefore, in order to increase innovativeness, we need to understand why. As described above, there are several interrelated components that may play a role in an innovation system, and all are equally important. Hence, the objectives of this study cover a wide range of innovation system participants including public and private organizations, government, other major actors. Further, understanding the roles and responsibilities of these major actors can aid in articulating prime opportunities and barriers to increasing innovation, and even help to develop some recommendations for overcoming the barriers.

Methods

Data for this study was collected in two phases. Phase one consisted of personal and phone interviews with select individuals, supported by a mail survey in phase two. Data collected from the survey was analyzed using the statistical software SPSS.

Phase I

The purpose of phase one was to ensure the researcher had a thorough understanding of current practices within Oregon's forestry SIS to enable construction of a questionnaire and mail survey. In order to do this the researcher 1) conducted interviews, and 2) collected secondary information. Data collected in this phase helped to fulfill objective one: to identify public and private organizations and other major players, and objective two: to identify major local, state, and federal policies and incentives related to Oregon's forest SIS.

Interviews

A semi-structured interview protocol was utilized to help ensure the same basic questions were covered in each interview and also to allow the interviewer the freedom to provide clarification or probe for elaboration beyond a first response (Berg, 2009). The opportunity to change wording, but not the meaning of the question, allows for adjustment as it is likely that not every respondent will interpret a question in quite the same way (Barriball and While, 1994). As the meanings of the questions were not changed, the semi-structured interview ensured comparability between respondents and facilitated validity and reliability (Barriball and While, 1994). The information sought in this study further supported the use of personal interviews, since developing essential trust and rapport between the interviewee and the interviewer is easiest to achieve in person. Hence, as the preferred method of choice, personal interviews were conducted when possible, when conflicts to meeting in person arose, interviews were conducted over the phone (3 of 13 interviews).

The Conceptual Model of Oregon's Forest Cluster (Figure 2) provided an overview of the three broader fields that should be addressed during the interview: the core forest industry, core industry organizations, and forest cluster participants. Questions were written to discuss all three divisions of the cluster and how they may contribute to Oregon's forestry SIS. Here are examples of just a few interview questions that were asked: "what, or who, are the main enablers of innovation in Oregon's forest sector",

“how important is government support in the form of an innovation policy or incentive for Oregon’s forest sector”, and “what are other private organizations or foundations doing to promote innovation in Oregon’s forest sector”. The interview protocol was developed in collaboration with the student researcher and academic advisors. Once the interview protocol was completed it was reviewed by the OSU Forest Business Solutions Group; a group of graduate students with a study emphasis in forest products marketing. The protocol was finalized after applying minor adjustments (Appendix A).

Identification of interviewees was done through a combination of resources.

Recommendations from OSU experts identified the initial potential interviewees. These potential interviewees were then contacted via email regarding their willingness to participate in the study, and if they responded some follow-up was done to schedule a time and place to conduct the interview. Snowball sampling was later used in order to identify the remaining interviewees. Snowball sampling is a method of utilizing your current interviewees and asking for their recommendations as to who may be knowledgeable in that research area. Beginning with recommendations from academic sources and finishing with industry recommendations helped to ensure no potential interviewees were overlooked before making a final selection.

Secondary Information

The secondary information gathered was predominantly about what policies and incentives are available to Oregon wood products manufacturers. This information was

sought after completing industry interviews as the interviewees provided several leads to follow-up on and policies to learn more about. This information was found almost entirely through web-searches, and in most cases searching for one specified policy or incentive lead to the discovery of several more. In total approximately 90% of the identified policies and incentives were found during secondary research and only about 10% were identified during interviews.

Phase II

After gaining a better understanding of Oregon's forest SIS, construction of a survey (Phase II) could begin. The main goal of data collected from phase II was to directly address objective three: clarify the roles and responsibilities of key organizations, policies and incentives, and four: to identify prime opportunities and barriers to increasing innovativeness in the forest manufacturing sector. Data collected during interviews (Phase I) helped to identify the specific organizations, policies and incentives to ask about in phase II. A mail survey was the method utilized in this phase.

The survey followed Dillman's (2007) Tailored Design Method. As suggested by Dillman (2007), the original Total Design Method (TDM) may not be appropriate as it is a one-size-fits-all approach and does not "take into account critical differences in survey populations, sponsorship, and content". Objective four required the target population of the survey be specifically Oregon's wood product manufacturers. This target population further supported the use of the Tailored Design Method as Oregon's forest product

manufacturers consist of a range of diverse companies. For example, a forest products company could be a: sawmill, wood preserver, millwork cabinet or furniture maker, a producer of engineered wood products, trusses, prefabricated buildings, etc.

In total, the survey consisted of three parts: 1) a cover letter explaining the purpose of the study, 2) the questionnaire, and 3) a prepaid business reply envelope. Each questionnaire had an identification number specific to one Oregon manufacturer in the upper right hand corner. This identification number was necessary to identify and remove respondents from the second wave mailing list. Before beginning the survey, the questionnaire was pre-tested on ten industry experts who were outside of the target population and was also reviewed by the OSU Forest Business Solutions Group. The questionnaire was finalized after applying minor adjustments (Appendix B) and was printed at the OSU Printing and Mailing facilities.

The bulk of the questionnaire was dedicated to understanding wood products manufacturers' awareness of the financial, educational and/or technical resources that are available to them. In total there were four sections regarding these available resources and they were categorized by provider: "State Programs", "*Business Oregon* Programs", "Other Programs" and "Federal Programs". For each individual resource listed, the respondent was asked to select the most appropriate answer from the three provided options. The three options included: 1) "yes" my company has used the resource in the last five years, 2) no my company has not use the resource but is "aware of the program",

or 3) no my company has not used the resource and is “unaware of the program”. There were also questions about: company characteristics, improving awareness, organizational constraints to being innovative, industry constraints to being innovative, innovative collaborations, perceived level of innovativeness, and the type of innovation being practiced.

A mailing list of 1,021 wood products manufacturers in Oregon, as identified by Standard Industrial Classification (SIC) Codes, was purchased from USAData. SIC codes are assigned numeric codes used to identify the primary business of the establishment (siccode.com). For this study SIC codes within the manufacturing sector were the target, and more specifically SIC codes starting with 24 (Lumber and Wood Products, Except Furniture) and 25 (Furniture and Fixtures). After refining the list by eliminating duplicates, businesses outside of the target population (for example Addy's Inc. Bar & Restaurant), and businesses that were known to have closed, a final mailing list of 698 contacts remained; thus 698 questionnaires were mailed.

Data Collection and Analysis

Phase I

Interviews began December 2nd 2011, and were completed by February 8th 2012. Notes were taken during each interview and all interviews were also audio recorded. Data collected during phase I was analyzed and reviewed solely by the researcher as the main purpose of this information was to prepare for the construction of a questionnaire. The

written notes were coded by response and then tallied to identify any patterns. Full transcription of the audio recording was deemed unnecessary as the main objective of this phase of data collection was to educate the researcher, however supporting quotes were transcribed.

Key innovation system participants such as the Oregon Forest Industries Council, Business Oregon, Oregon Department of Energy, Western Wood Products Association, US Forest Service, Oregon State University, the Oregon Wood Innovation Center and several companies in the sector were represented in the final group of interviewees. In total thirteen interviews were conducted; ten in person and three over the phone. The interview length ranged from approximately thirty to seventy five minutes.

Phase II

The first wave of questionnaires was mailed March 9th 2012, followed by the second wave on March 28th 2012. As responses were received they were recorded, using their identification number, and removed from the second wave mailing list. The removal of respondents from the original mailing list also later allowed for the identification and random selection of non-respondents to test for a non-response bias.

Data from each response was numerically coded, entered, and tested using statistical software SPSS. Chi-square tests were conducted to discover a potential relationship

between firm size, manufacturer type, or firm innovativeness and awareness of State, Business Oregon, Other, and Federal resources. In order to do this a new variable was created called Overall Awareness and encompassed all the results from State, Business Oregon, Other and Federal resources questions. To make comparisons between firm innovativeness a cluster analysis was conducted, and identified three different levels of firm innovativeness: 1) less innovative, 2) more innovative, and 3) extremely innovative. Other, more simple, analysis of the data that was conducted was a frequencies to determine how many, or what percent of respondents answered in a certain way.

In the questionnaire immediately following the four sections about the use and awareness of available programs are a series of open-ended questions. The questions ask about: recommendations for increasing program awareness, organizational constraints to being innovative, industry constraints to being innovative, and innovative collaborations. The open-ended questions were coded by response and then tallied to identify patterns.

Non-Response Bias

Testing for non-response bias was conducted by contacting a random sample of non-respondents from the original mailing list minus respondents. In total 30 non-respondents were contacted by phone and were asked three short questions from the original questionnaire. Those three questions included one question about the size of the company (question two in questionnaire), and two rating questions about the company's

level of innovativeness (first and last part of question 15 in questionnaire, Appendix C). An independent sample t-test was conducted using statistical software SPSS to compare the respondent and non-respondent groups. P-values for all three questions were .133 or larger, revealing no statistical difference between respondent and non-respondent groups. No difference between the groups indicates there was no measureable response bias and therefore the results of this survey are assumed to be representative of the target population, Oregon forest products manufacturers.

Results and Discussion

A majority of the results found during interviews were also found in the survey results and therefore, in order to avoid repetition, will only be covered once in the Phase II section.

Phase I

A few significant points that were found during interviews, which were not found in the survey, are the following. First, in response to the question about the main enablers of innovation in Oregon's forest sector, the main response was Oregon State University and the Oregon Wood Innovation Center. Interviewees had responses like: "... in the research sector, OSU is a prime driver of innovation", and "Oregon State University's Wood Science department definitely has a hand in developing new technologies". It was relayed that the cutting edge research and industry support occurring at both OSU and OWIC are extremely influential and beneficial to innovative efforts within the industry. On a similar track, interviewees reported that the majority of forest sector collaborations

in the state of Oregon are occurring between academia and wood products manufacturers. A representative response for this result would be, for example: “industry ‘innovates’ in collaboration with research universities like OSU. Without university research industry is left going overseas or outsourcing, and without the industry, university programs don’t have the funding for research.”

The last significant finding to report is the interviewees’ perception of culture in the forest sector. When asked how Oregon’s forest sector could be more innovative, the typical response was to change the overall culture. For example, “‘Industry’ will need to make innovation a strategic focus . . . , which is going to take a cultural change. They will also need to be more willing to take risk.” Further, when asked the follow-up question about how to change an industry culture, the recommendation was to hire more student interns. The explanation being that incorporating younger educated employees into the work place would be the most direct way to begin to alter the culture of the industry; “. . . could hire more students; hire people who have exposure to the technology and changes that are going on in the industry.”

As a result of the interviews, a description of the current state of Oregon’s forest sector innovation system began to take shape. Interviewees described Oregon’s forest sector as having a competitive advantage due to the accessibility and proximity to raw materials and “in regards to infrastructure, Oregon’s is pretty good. ‘Oregon has’ great loggers, and pretty darn good sawmills. For export, the shipping containerization and stuffing

facilities are all pretty good, and it's a great location for world trade that's for sure.”

However, even with the availability of raw material and a seemingly developed infrastructure the main constraints to being innovative are still overwhelming the system. A more detailed discussion of the major constraints to the innovation system of Oregon's forest sector will be presented in the proceeding section.

Phase II

In total 698 questionnaires were mailed, from that 131 responses were received, and 155 questionnaires were undeliverable; leading to an adjusted response rate of $24\% = 131 / (698 - 155)$.

Company Characteristics

Respondents were predominantly millwork, cabinet or furniture makers with 1-19 employees. This was determined after calculating a simple frequency of the two company characteristics questions asked in the questionnaire (see specific Manufacturer Type and Firm Size distributions in Tables 2 and 3). After some deliberation, size was regrouped into: 1) less than 20 employees, and 2) more than 20 employees (Table 3). This regrouping was done for several reasons. First, the distribution of size was extremely skewed towards the less than 20 category, and all of the other categories had extremely small sample sizes. Therefore, and for the sake of having large enough sample sizes to conduct statistically sound tests, size was regrouped into the two broader categories. As a further justification of this regrouping, it was obvious during data entry that the smaller

versus larger groups drastically differed in the rest of their responses. The difference in responses between smaller and larger firms provides an opportunity for further exploration and will be revisited in the Future Research section.

Table 1: Manufacturer Type

Type	Frequency	Percent
Sawmill	18	13.7
Wood Preserving	5	3.8
Millwork, Cabinets & Furniture	66	50.4
Plywood & Engineered Wood Products	10	7.6
Residues	4	3.1
Boxes & Pallets	2	1.5
Prefabricated Buildings	4	3.1
Trusses	1	.8
Reconstituted Wood Products	4	3.1
Other	17	13.0
Total	131	100.0

Table 2: Firm Size

Group	# of Employees	Frequency	Percent	Frequency (by group)	Percent (by group)
Less than 20	1-19	82	63.6%	82	63.6%
More than 20	20-49	16	12.4%	47	36.4%
	50-99	11	8.5%		
	100-249	7	5.4%		
	250-500	6	4.7%		
	500+	7	5.4%		
Total		129	100.0%	129	100.0%

Program Awareness

The results for use of available financial, educational or technical resources would better be described as overall forest sector manufacturer unawareness. The explanatory figures

below (Figures 4, 6-8) completely disregard the “Yes” option from the questionnaire as this response was non-existent in most cases (see specific results for each individual program in Appendix). In the few cases where the “Yes” option was selected that response was regrouped into awareness; and therefore the tables below only report two responses, aware and unaware.

Awareness of State Programs ranged from 17% with the Oregon Angel Fund (OAF) to nearly 50% awareness of the Biomass Energy Tax Credit (BetC) (Figure 4). The specific results for awareness of available State Programs were similar to the Other, Business Oregon and Federal Program results; except for in one case. BetC is an outlier in both the use and awareness as compared to any other available state program, 20% of the awareness directly attributed to use of the program (Figure 5). Overall the average awareness of state programs is 31%; meaning, on average, 31% of Oregon’s wood products manufacturers are aware of the available resources provided to them through the state.

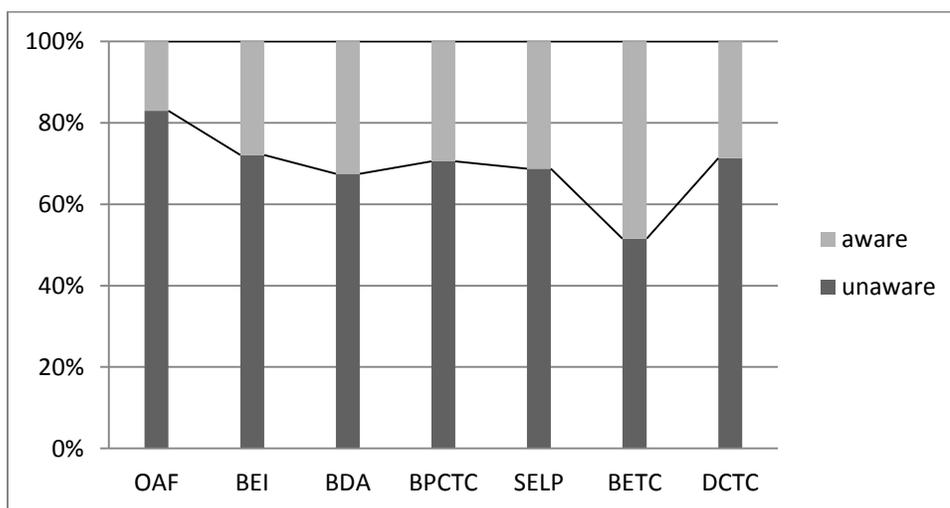


Figure 4: Oregon Wood Products Manufacturers Awareness of State Resources

(OAF=Oregon Angel Fund, BEI=Biomass-to-Energy Installation, BDA=Business Development Assistance, BPCTC= Biomass Producer or Collector Tax Credit, SELP= State Energy Loan Program, BETC=Biomass Energy Tax Credit, DCTC=Dependant Care Tax Credit).

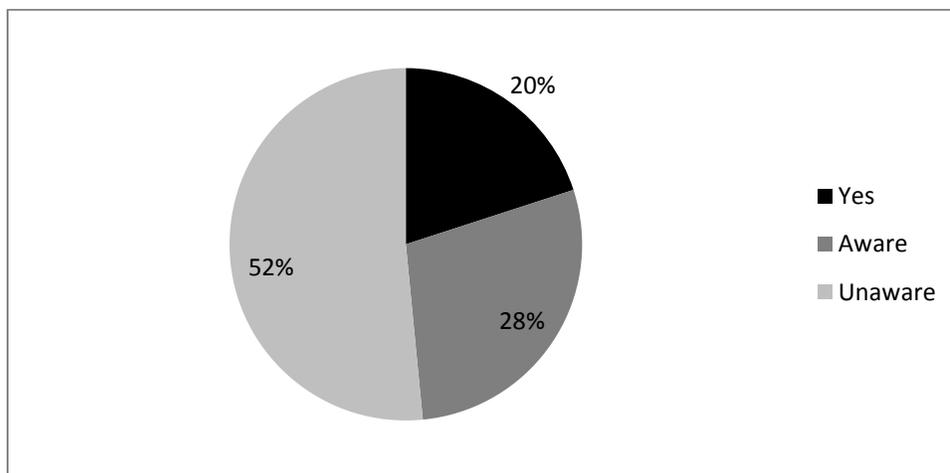


Figure 5: Oregon Wood Products Manufacturers Use and Awareness of BetC

The resources provided to wood products manufacturers by Business Oregon did not have any more awareness than the state resources. The average awareness of Business Oregon programs was 18%, ranging from 12% awareness of the Entrepreneurial Development Loan Fund (ELDF) to 23% awareness of the Oregon Business Development Fund (OBDF) (Figure 6).

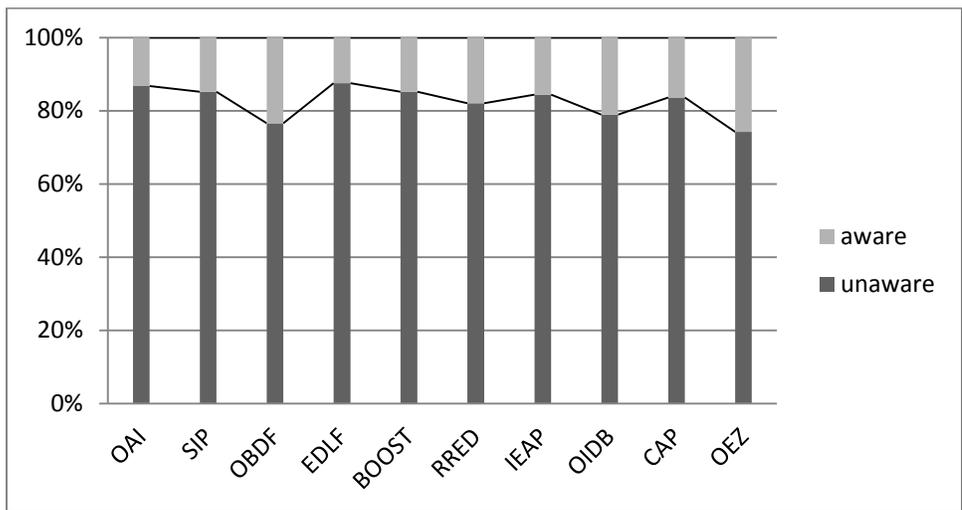


Figure 6: Oregon Wood Products Manufacturers Awareness of Business Oregon Resources

(OAI= Oregon Investment Advantage, SIP=Strategic Investment Program, OBDF=Oregon Business Development Fund, EDLF=Entrepreneurial Development Loan Fund, BOOST=Building Opportunities for Oregon Small Business Today, RRED=Rural Renewable Energy Development Zones, IEAP=International Export Assistance Program, OADB=Oregon Industrial Development Bonds, CAP= Oregon Capital Access Program, OEZ=Oregon Enterprise Zone).

The educational and technical resources provided by a number of other organizations had the highest overall awareness at 36%; ranging from 19% awareness of Oregon BEST to 55% awareness of educational and technical resources provided by Oregon State University (OSU) (Figure 7).

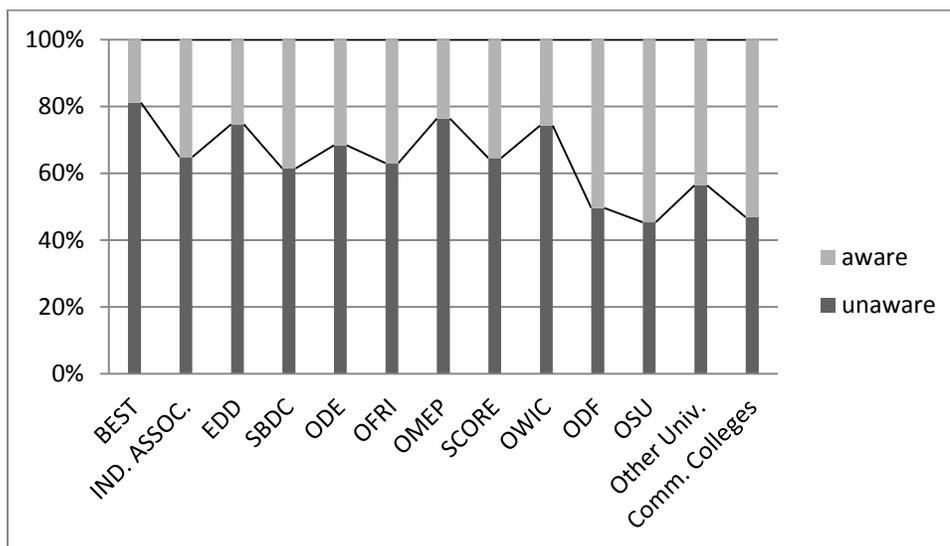


Figure 7: Oregon Wood Products Manufacturers Awareness of Other Resources

(BEST=Oregon Build Environment and Sustainable Technologies Center, IND. ASSOCI.=Industry Associations, EDD=Economic Development District, SBDC=Small Business Development Centers, ODE=Oregon Department of Education, OFRI=Oregon Forest Resources Institute, OMEPE=Oregon Manufacturing Extension Partnership, SCORE= Service Corps of Retired Executives, OWIC=Oregon Wood Innovation Center, ODF, Oregon Department of Forestry, OSU=Oregon State University).

Lastly, and despite providing the most programs, the financial incentives that are available to Oregon wood products manufacturers through the federal government had the lowest overall awareness (Figure 8). The average awareness of Federal Programs was 14%, ranging from 10% awareness of the Export Express Program (EEP) to 20% awareness of the Small Business Administration 504 Loan Program (504 Program). What's important to take away from all of these results is that there is availability of financial, educational and technological resources for Oregon wood products manufacturers, but there is little awareness and even less use of these available resources.

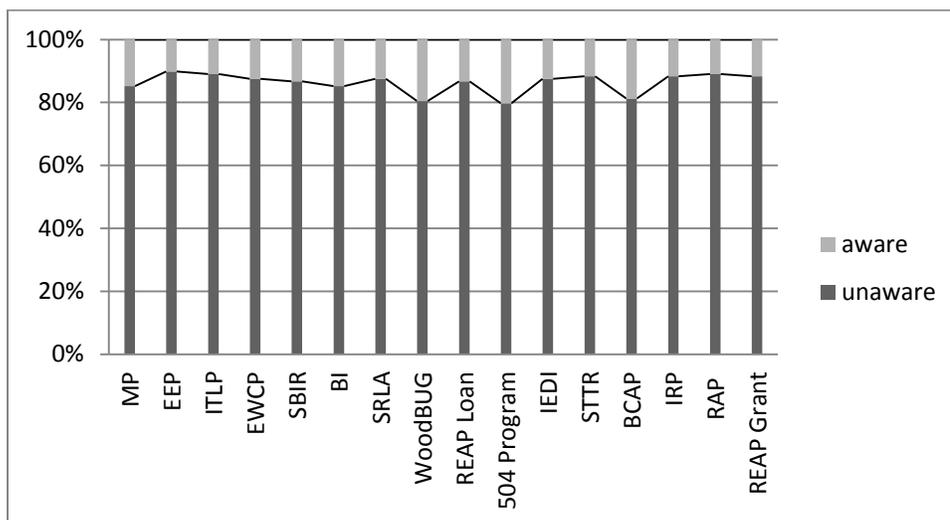


Figure 8: Oregon Wood Products Manufacturers Awareness of Federal Resources

(MP=Microloan Program, EEP=Export Express Program, ITLP=International Trade Loan Program, EWCP=Export Working Capital Program, SBIR=Small Business Innovation Research, BI=Business and Industry Guaranteed Loans, SRLA=Small/Rural Lender Advantage Initiative, WoodBUG=Woody Biomass Utilization Grants, REAP Loan=Rural Energy for America Program Loan, 504 Program=Small Business Administration 504 Program, IEDI=Innovation Ecosystem Development Initiative, STTR=Small Business Technology Transfer, BCAP=Biomass Crop Assistance Program, IRP=Intermediary Relending Program, RAP=Repowering Assistance Program, REAP Grant=Rural Energy for America Program Grant)

Increasing Awareness

Somewhat surprisingly, the most preferred (30%) method to increasing awareness was to have paper information mailed to them directly, as opposed to having access to virtual information either online or via email (15%) (Figure 9). In fact, based on some of the written responses, this research in itself may have helped to increase program awareness. For example, respondents wrote things like: “mail outreach to small sawmills, like this questionnaire”, and “a summary of available programs would be nice, just a list like shown above”. Similar comments were received during pre-testing of the questionnaire, even some of the experts were surprised at the scope of the programs offered.

A few other recommendations for improving program awareness included implementing personal visits from experts to wood products manufacturers educating them about the programs. One manufacturer said, “have an agent come and present the opportunities relevant to our business”. There were also a significant number of respondents who said they didn’t have any recommendation for improvement (I Don’t Know), that government involvement is unnecessary or that they weren’t looking for any assistance and therefore there is no need for increased awareness.

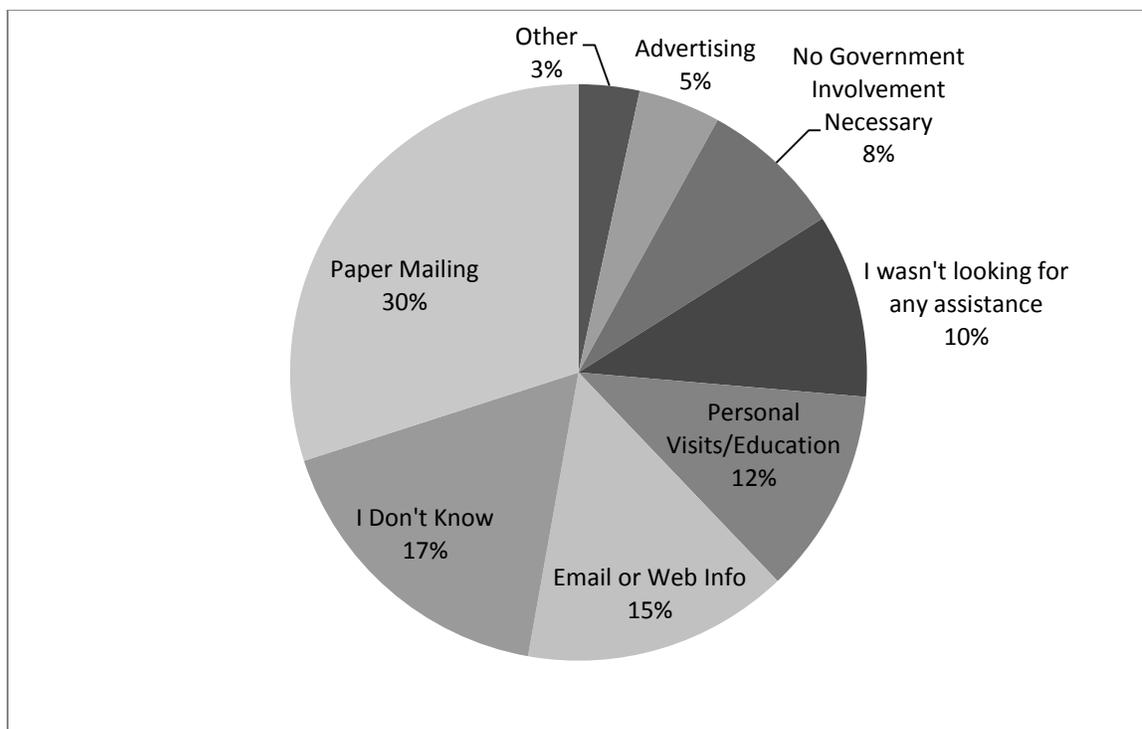


Figure 9: Potential Solutions to Increase Program Awareness

Major Organizational Constraints to Being Innovative

Most of the responses could be attributed to a “Poor Economy” response, but are more specific and descriptive as individual categories like reported below (Figure 10).

Currently, the largest constraint to Oregon wood products manufacturers is financial limitations. This likely effects the creation function of an innovation system since financial resources are one required input (Figure 3). One manufacturer, after relaying that the main constraint was financial flexibility, even went so far as to provide examples of where money would be required; “cost of introducing new products: a) equipment, b) administrative, c) new product line prior to pay back, d) advertising”.

The second largest reported constraint to being innovative was the poor economy (20%). “Lack of business through this recession” is a good representation of the type of responses that got categorized into the poor economy section. Aside from the lack of money and poor economy there were three other perceived constraints for manufacturers; and those were time, man power and government in general. The responses around a lack of time and man power were pretty straightforward and probably a realistic description of the forest sector today. They described situations where a company is understaffed and an employee’s energy is dedicated to the very essential business practices, and simply don’t have time to think about or try innovative ideas. 14% of respondents said that government was their major constraint to being innovative. These responses tended to be very extreme and passionate in nature; for example, “we don’t want government help with our business; we want them out of our business!”. Lastly, a

small portion (5%) of respondents said that there are no constraints and “that we are as innovative as we need to be”.

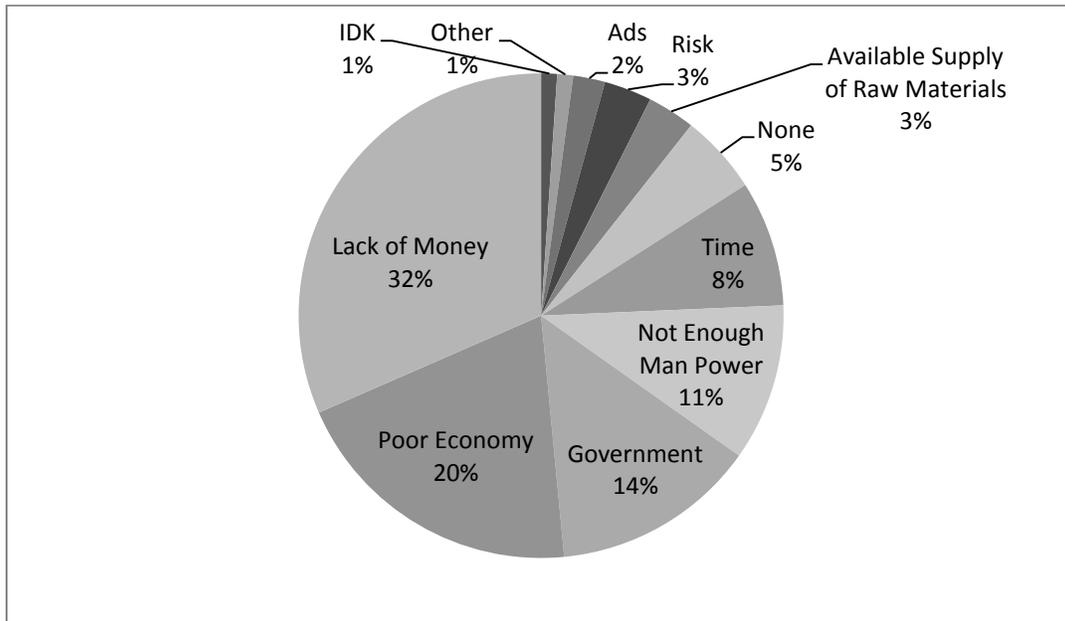


Figure 10: Organizational Constraints to Being Innovative

Major Industry Constraints to Being Innovative

As expected, many of the reported industry constraints were the same as the organizational constraints. However, there were also a few interesting additions and changes in the degree of constraint. Like the organizational constraints we see responses regarding a lack of money, poor economy, and government but for the first time the idea of industry culture as a constraint appears (Figure 11). Manufacturers that thought culture was a constraint said things like, “today's managers are older and from a different era of forestry, and so they tend to resist change”. It’s interesting to notice how manufacturers don’t perceive their own organizational culture to be a constraint, but do perceive it to be a fairly significant constraint within the industry. In fact, this difference

in perception between organizational and industry constraints makes up the bulk of the discussion for the remaining findings of industry constraints.

The difference in perception between organizational and industry constraints was further communicated in the “lack of timber supply from our federal land” response. The availability of raw materials wasn’t recognized as a main constraint for the individual organizations (only 3%) but is perceived to be a much more significant constraint within the industry (12%). This disparity could be due to the fact that a majority of the respondents are secondary manufacturers and are not directly dependant on federal timber, but they perceive that other primary manufacturers in the industry are. Also, the “I don’t know” answer took a large jump from only 1% in the organizational responses to nearly 20% in the industry constraint responses. All in all, these results indicate that there may be a disconnect between what is happening within an organization and what is perceived to be happening in the industry as a whole.

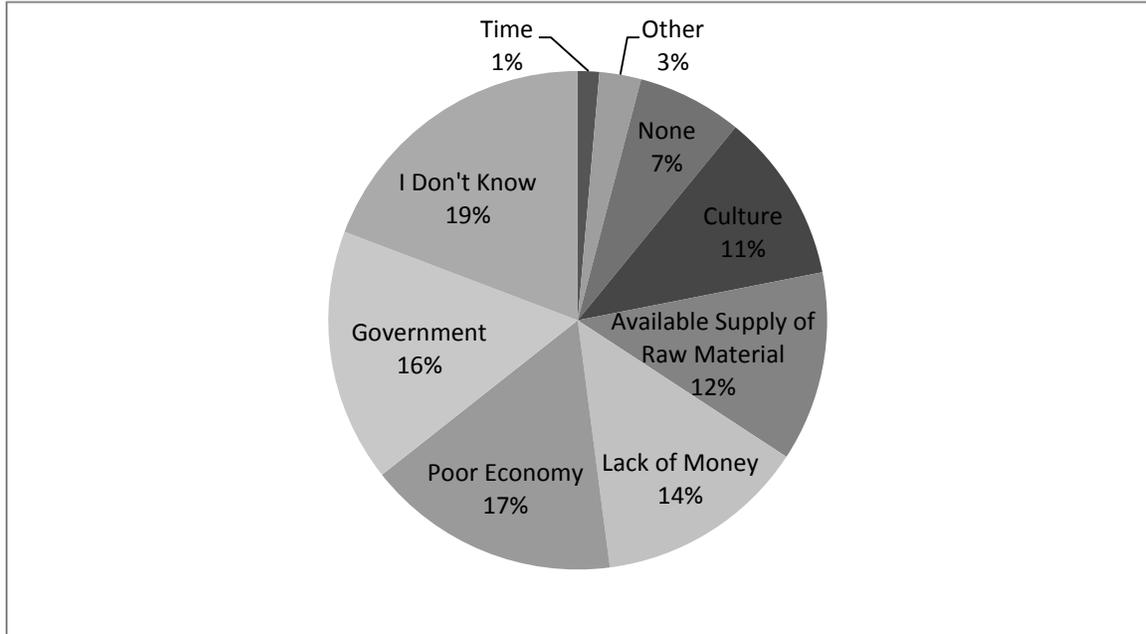


Figure 11: Industry Constraints to Being Innovative

Collaborative Innovation

The overwhelming majority (50%) of manufacturers simply said no; they do not participate in any collaboration (Figure 12). The second largest response, at 18%, was that manufacturers collaborated with Industry Associations; and 15% said they collaborated “with other manufacturers, sometimes even competitors”, or in other words they collaborated within industry. Surprisingly, only 3% of respondents said they actively collaborated with their customers. This is surprising because it is likely the most direct way to receive accurate feedback about product performance and what your customer really needs.

Interestingly, the survey results were not at all similar to the interview results about the innovative collaborations that are occurring. Recall interviewees reported that most industry collaborations occur between manufacturers and academia, and this was not a collaboration mentioned by survey respondents. One explanation for this inconsistency is the difference in the two populations. The interviewees consisted of a few manufacturers, but mostly state organizations and other associations. So, the interview results can be concluded as perceived, and the survey results are actual.

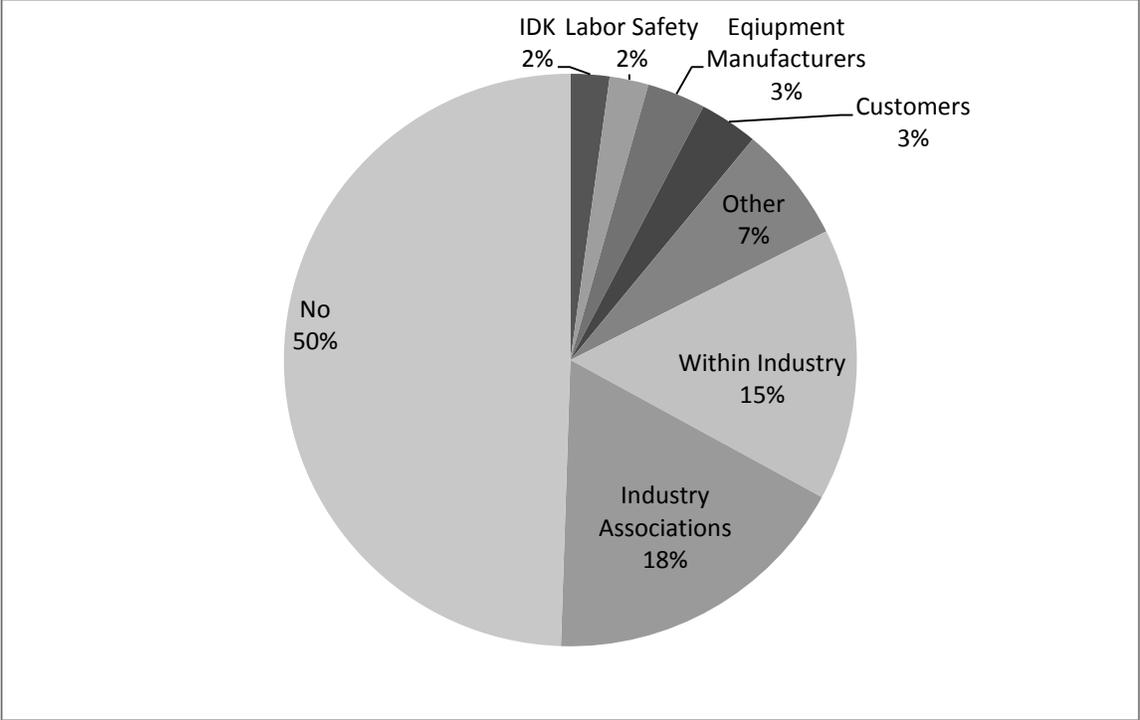


Figure 12: Oregon’s Forest Sector Innovative Collaborations

Relationships between Awareness or Innovativeness

As a reminder, a new variable called “Overall Awareness” was created by combining all results from State, Business Oregon, Other, and Federal program awareness questions. Overall Awareness regrouped respondents into either ‘unaware of all’ or ‘aware of at least one’ available resource. This new variable was then utilized in three chi-square tests to discover if there is a relationship between overall awareness and firm size, firm innovativeness, or manufacturer type.

So, does overall awareness differ between firm sizes? The answer is yes; p-value = .001 (Table 4). It would appear that the firms with more than 20 employees are more aware of the resources available to them, as compared to the firms with less than 20 employees. 95% of the *larger* firms were aware of the resources available to them, where only 71% of the *smaller* firms were.

Table 3: Difference in Overall Awareness between Firm Size

Overall Awareness	Size		χ^2	p-value	Effect Size
	Less than 20	More than 20			
Unaware of all	29	5	11.9	.001	.29
Aware of at least one	71	95			

Cell entries are percentages of respondents with less than 20 or more than 20 employees and whether they are unaware of all available resources or aware of one or more.

The other two relationships compared were overall awareness with firm innovativeness and manufacturer type. Neither of these relationships was statistically significant as both cases had a p-value > .141. Therefore, there was no manufacturing type that was more

aware of the available resources, and the firms perceived level of innovativeness did not translate to a higher level of resource awareness.

Discussion and Conclusions

Discussion and conclusions are presented for each specific objective 1-4, and the primary objective of the study.

Specific Objective 1

The first specific objective was to identify public and private organizations involved with Oregon's forest sector IS, as well as other major actors. While an exhaustive list of all actors that are involved with Oregon's forest sector innovation system was not composed, a list of some of the major actors was. This objective was achieved during both phases of data collection and includes the interviewees themselves as well the organizations that they identified as involved with Oregon's forest sector innovation system. In addition to the organizations that were identified by the interviewees, five others are added to that list. The additional organizations related to forest sector manufacturers are: the Oregon Bureau of Labor Industries (BOLI), the North American Wholesale Lumber Association (NAWLA), Oregon Building Codes Division (BCD), and Occupational Safety and Health Association (OSHA). These four additions were identified by survey respondents as other sources that they have utilized in the last five years.

Not all of the identified entities on this list are based in Oregon, which may cause some confusion as to how they relate to Oregon's forest sector innovation system. However,

the Hardwood Plywood and Veneer Association (HPVA) for example, although located in Reston Virginia, has a large portion of its members based in the Pacific Northwest and within the state the Oregon. For this reason the HPVA, like many others, has a direct connection to Oregon's wood products manufacturers while not being physically located within the state. All of the major actors listed in Table 5 were specifically mentioned during interviews, or written in as a survey response. Therefore, there are almost assuredly other major actors of Oregon's forest sector innovation system, but only those that were directly identified through this research are listed (Table 5).

Table 4: Major Actor's of Oregon's Forest Sector Innovation System

Public Organizations
Business Oregon*
Central Oregon Builders Association
Energy Trust of Oregon
Hardwood Plywood and Veneer Association (HPVA)
International Wood Products Association (IWPA)
Occupational Safety and Health Association
Oregon BEST
Oregon Building Codes Division
Oregon Bureau of Labor Industries
Oregon Business Council
Oregon Business Development Department
Oregon Department of Education
Oregon Department of Energy*
Oregon Department of Forestry
Oregon Economic Development Districts
Oregon Forest Cluster Initiative Group
Oregon Forest Resources Institute*
Oregon Manufacturing Extension Partnership
Oregon Solutions
Oregon State University*
Oregon Wood Innovation Center*
Service Corps of Retired Executives (SCORE)
Small Business Development Centers

US Forest Service*
Western Wood Products Association*
Wood Based Composite Center
Private Organizations
Collins Company*
Composite Panel Association
FORD Foundation
Georgia-Pacific
Hampton Affiliates
Lucidyne Technologies Inc.
North American Wholesale Lumber Association
Benchmark International*
Roseburg Forest Products
Seneca Sawmill Company
The Engineered Wood Association
Vanport International*
Ventek
Weyerhaeuser
Willamette Valley Company*
Other
President of Roseburg Forest Products Allyn Ford
Composite Panel Association President Tom Julia
HPVA President Kip Howlett
IWPA Executive Vice President Brent McClendon
John Hampton of Hampton Affiliates
Koch Brothers of Georgia-Pacific
Pacific Forest Trust
Port of Portland
Seneca Sawmill founder Aaron Jones
Starker Brothers of Starker Forests
Sustainable Northwest*
* = Interviewed

Specific Objective 2

Identification of major local, state, and federal policies and incentives related to forest sector manufacturers was completed predominantly through secondary research and interviews. The resulting list was then utilized during the industry survey. While there are likely local policies or incentives as related to Oregon's forest sector manufacturers

such as legislation or building codes, now were identified. However, there were several state and federal policies and incentives, those included:

Table 5: State and Federal Resources Related to Oregon Forest Sector Manufacturers

State
Biomass Producer or Collector Tax Credits
Biomass-to-Energy Installations
Building Opportunities for Oregon Small Business Today
Business Development Assistance
Business Energy Tax Credit
Dependent Care Tax Credit
Entrepreneurial Development Loan Fund
International Export Assistance Programs
Oregon Angel Fund
Oregon Business Development Fund
Oregon Capital Access Program
Oregon Industrial Development Bonds
Oregon Investment Advantage
Oregon's Enterprise Zones
Rural Renewable Energy Development Zones
State Energy Loan Program
Strategic Investment Program
Federal
Biomass Crop Assistance Program
Business and Industry Guaranteed Loans
Export Express Program
Export Working Capital Program
Innovation Ecosystem Development Initiative
Intermediary Relending Program
International Trade Loan Program
Microloan Program
Repowering Assistance Program
Rural Energy for American Program Guaranteed Loan Program
Rural Energy for American Program Feasibility Grant Program
SBA Certified Development Company 504 Program

Small Business Innovation Research
Small Business Technology Transfer
Small/Rural Lender Advantage Initiative
US Forest Service Woody Biomass Utilization Grant

Specific Objective 3

The objective to clarify the roles and responsibilities of key organizations, policies and incentives within Oregon’s forest sector innovation system was directly addressed during interviews. Question ten of the interview protocol asked, “how important is government support in the form of an innovation policy or incentive for Oregon’s forest sector”. The responses to this question were almost polar opposites; half of the interviewees had the opinion that government support was unnecessary while the other half thought it was extremely important. This inconsistency was further represented in several of the survey responses about government being a major organizational and industry constraint.

After further discussion with interviewees it was revealed that, in their opinion, the roles and responsibilities of key organizations, policies and incentives is to provide easy access to financial, technological and educational aid. Providing easy access to these resources included: dedicating a grant writer to help manufacturers with applications, better supporting the Oregon Wood Innovation Center (OWIC) to help maintain the OWIC directory, and implement a “one-stop-shop” web site for locating an appropriate grant or loan program.

Specific Objective 4

The last specific objective was to identify prime opportunities and barriers to increasing innovation in Oregon's forest sector.

Prime Barriers

Three prime barriers to increasing innovation in Oregon's forest sector have been identified as a lack of collaboration, a recovering economy, and the overall industry culture. As 50% of Oregon's wood products manufacturers are not participating in any type of collaboration they are also not realizing the potential benefits that collaborations have to offer. These benefits could include, but are not limited to, access to equipment or materials that they may not otherwise have, and information transfer that may result from discussion and feedback about industry trends, etc. In other words, the lack of collaboration between industry manufacturers is reducing their potential innovativeness. Correspondingly, this lack of collaboration can be attributed to the overall industry culture; another prime barrier to being innovative. The culture of Oregon's forest sector is resistant to change with a general mentality of, don't fix it unless it's broken as indicated by interviewees. This culture, and the ability to change this culture, will have a major impact on the future success of Oregon's forest sector innovation system as it has such a large influence on business practices.

The last prime barrier to being innovative in Oregon's forest sector is a result of the business environment, and not necessarily the culture of the industry. This barrier

encompasses a majority of the responses around organizational and industry constraints; the poor economy. The forest products industry took a major hit in business beginning in 2008 with the decline in the number of housing starts. For many forest products manufacturers this recessionary period was more than they could survive; and for the more fortunate it meant, at the very least, decreased profit margins. As far as innovative activity goes, the recession had a snowball effect beginning with reduced business and profits leading to a reduced number of employees, which directly affected the amount of available time to partake in innovative activities. For some this snowball effect made new product development, with no guaranteed pay back, an even more risky endeavor; and for others it made process innovation a necessity for survival. In a few unique cases the recession drove innovation, requiring manufacturers to improve processes and efficiency. It is expected that, as the economy starts to recover and the housing market begins to normalize so will the wood products industry.

Prime Opportunities

The prime opportunities to increasing innovation in Oregon's forest sector have been identified as: 1) high availability and little use of financial resources, 2) utilizing OWIC, and 3) sharing the results of this research. These opportunities will be discussed at length in the proceeding section.

Primary Objective

To recap, the primary objective of this research is to provide a comprehensive description of the current innovation system in Oregon's forest sector and provide recommendations for improvement upon this system. The four specific objectives were proposed as a means of achieving this overall objective.

The conceptual model of an innovation system, proposed by Kubeczko's et. al (2006), is revised with details more specific to Oregon's forest sector innovation system (Figure 13). As described in the theoretical background, the three functions of an innovation system are Create, Implement, and Diffuse innovations into the market place. Further, there are three main inputs required for the creation of an innovation, those being: financial, knowledge and human resources. Lastly, the industry culture or policy has an integrated influence on the entire innovation system.

Description of Oregon's Forest Sector Innovation System

Oregon's forest sector innovation system has all the necessary tools to be successful but must overcome the identified barriers in order to increase functionality. The culture is largely change resistant, and firm/interfirm cooperation is approximately 50% (Figure 13). The majority of the innovative activity is resulting in process innovations for "optimization", and policy around innovation in the forest sector is developing as shown by the efforts of the Oregon Forest Resources Institute and the Oregon Forest Cluster Working Group. A main supplier of the human and knowledge resources required for the

creation function are Oregon State University and the Oregon Wood Innovation Center. OSU’s College of Forestry has been graduating an educated and skilled work force since 1911 and OWIC provides a critical link to academia and experts in the field of wood science. The financial resource required for the creation function is not being met, but has the potential to be completed by available state and federal incentives.

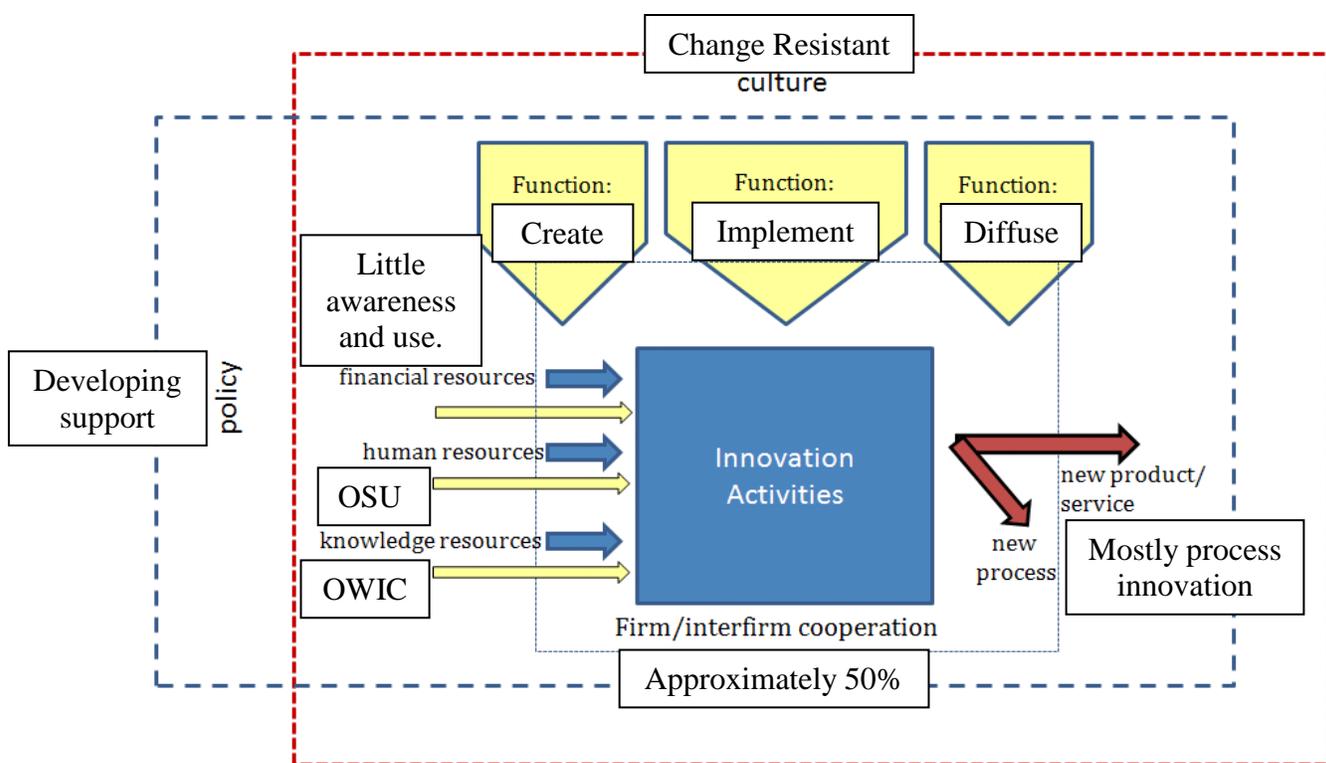


Figure 13: The Current State of Oregon’s Forest Sector Innovation System

Recommendations

The forest sector innovation system is encountering road blocks in the early phases of development, and for the most part is being stalled before innovative creation can even

begin. The change resistant culture, poor communication and a lack of financial resources are the road blocks. Therefore, the following recommendations have been developed to address these hindrances. The first recommendation is to further utilize OWIC as an outlet to increase awareness of policies, incentives, and other tools. As revealed in the results, there is little awareness and high availability of financial resources for wood products manufacturers. As the reported main organizational constraint to being innovative was a lack of money, the availability of incentives provided by the state and federal government can be a means of reducing the financial risk involved with an innovative project. As OWIC already sends out a quarterly newsletter to its members via email, including some information about these programs could be a fairly simple addition to the normal layout. Further, there is the prospect of dedicating an area on the OWIC website specifically to these resources. Implementing a page of summarized details and links to the applications could be the “one-stop-shop” for financial resources that was requested by interviewees. Given the relationship between OSU and OWIC, this is a prime opportunity to increase awareness of state and federal incentives and therefore address the issue of insufficient financial resources as a required input for the creation function.

The second recommendation is to increase the opportunities for student internships. As suggested by interviewees, increasing the ratio of younger educated employees to older traditional employees is likely the most direct way to make a lasting shift in the culture of the industry. Hovee (2005) had a same solution for increasing forest cluster vitality;

“improved knowledge of and interaction with students”. While there are currently student internship opportunities through OSU’s department of Wood Science, those opportunities are limited as they are provided by only a few core companies. The participating companies tend to be those with a long standing relationship with the department and include for example Sierra Pacific Industries, Flakeboard America, Roseburg Forest Products, and Murphy Plywood; not nearly an exhaustive list of Oregon’s forest products industry. As the main source of forest industry educated students in the state of Oregon, OSU will play a main role in the success of internship programs and altering the industry culture. In an effort to enhance diversity among their own student body, OSU’s department of Wood Science now offers an undergraduate degree in Renewable Materials. In two years the Renewable Materials program has made a drastic shift in the composition of its student body, changing from 16% female to 80% of their 2012 incoming class being female. As the industry is currently predominantly male, this can help to further support a more diverse workforce and alter industry culture. However, just because there are available students doesn’t necessarily mean there will be available internships for them to take. This availability of internships will have to come from the broader industry and not just a few companies. If increasing the available student internships was successful it could help to alter not only the culture but increase industry collaborations as well.

Lastly, providing the results of this research to policy makers and the Oregon Forest Cluster Working Group to inform them about the current state of innovation in Oregon’s

forest sector is a prime opportunity. Current information has the potential to redirect focus, influence recommended actions and help to further develop relevant policy.

Similarities to Maine's Biomass Innovation System

The findings of this research are similar to a recent study on the innovation system of Maine's Biomass industry. In this study, the innovation system of Maine's biomass industry also suffered from poor innovative collaboration and communication, and a major constraint to being innovative was a lack of financial resources (Stone et al., 2011). Further, a recommendation for improvement included strengthening the connection between industry and academia or other research centers (Stone et al., 2011). One other relevant point to make about this research is the connection to the Biomass Crop Assistance Program (BCAP). While this program had very high use and awareness, results showed that actually "all firms disliked the program and would rather it had not been implemented" (Stone et al., 2011). These results support findings from a similar study in Europe by Rametsteiner and Weiss 2006, "that policies consisting mostly of subsidies and capitol injections aimed at fostering innovation are largely ineffective". So, in regards to Oregon's forest sector innovation system, and taking a step back from simply increasing awareness and use of financial incentives, it is important to emphasis collaboration with policy makers and stakeholders to make sure policies achieve the intended outcome. Also, it may be important to redirect available monies from strictly manufacturing subsidies to support the ground roots innovation system, for example academia and or research centers.

Overall, the similarities between these two works reveal that other forest products related innovations systems share at least a few of the same barriers to improved functionality. This research and the proposed recommendation can therefore be used to further support the case for action. If recommendations are implemented and successful they can be used as a tool and proven method for other forest products innovation systems across the nation.

Limitations

There are some limitations with the data collection and analysis of this research that should be discussed. The main limitations revolve around the comprehensiveness of this research, which may be limited by the number of interviews conducted, survey response rate, and clearly identifying the boundaries of Oregon's innovation system. As always, the opportunity to conduct more interviews would provide more comprehensive findings. Also, the final list of interviewees was selected mainly by advisor recommendations and convenience sampling. This may have lead to some bias in interviewee responses as the advisor recommendations happened as a result of personal contact information, and therefore the interviewee had some relationship with OSU. In regards to convenience sampling, if a potential interviewee either did not respond to the initial contact email, or responded that they were unavailable, they were eliminated. Therefore, as one filter of interviewee selection was based on their availability, the results of the interviews may not be entirely representative. Further, the process of coding interview results was not done

by multiple individuals but rather was done solely by the researcher. Without inter-coder reliability, there is an increased potential of introducing researcher bias to the interview results.

In regards to the survey, a higher response rate is always desired as that would mean a better representation of the target population. Also, the use of USAData to provide a mailing list may have been a limitation. The inconsistencies with this list combined with the out-of-date information brings into question whether or not a truly comprehensive survey was achieved. As with the interview findings, the open-ended questions within the survey were coded only by the researcher, again increasing the potential for bias.

Lastly, identifying the definite boundaries of Oregon's innovation system can be extremely difficult to achieve. It's not something as simple as a state line, as the list of major actors of Oregon's innovation system (Table 5) has shown. As previously mentioned, several of the identified major actors (ie: Hardwood Plywood Veneer Association) are not located in Oregon but still have a direct influence. In reality neighboring states, in particular California, and other national influences will have an affect on the practices, products and trends in Oregon's forest products industry. However, a research scope of that kind goes far beyond the time allocation of a master's degree. Therefore, the results of this research provide useful insights into Oregon's forest sector innovation system, but really are only a first step towards an absolutely comprehensive picture.

Future Research

There are several opportunities for future research on this topic. A few of the smaller research opportunities would include the following. For one, it would be particularly interesting to make a case study of the state program BetC (Biomass Energy Tax Credit), to understand what made this program so much more successful (in use and awareness) as compared to any other financial incentives provided to the industry. Along the same line of thinking, it would be very valuable and persuasive to know exactly what dollar amount of financial resources (from state and federal incentives) are going unrealized by Oregon's wood products manufacturers. Meaning doing follow-up to discover how much money is being dedicated to each available financial program, and how much is actually being spent. Lastly, some assumptions can be made as to why there is a difference in awareness of available resources between small (less than 20 employees) and large (more than 20 employees) firms but follow-up to those respondents would be the only way to accept or reject those assumptions.

Trying to identify all the actors, roles, responsibilities and relationships in Oregon's forest sector innovation system would be similar to putting together a puzzle without knowing what the final picture is supposed to look like. You may be able to successfully piece together a few small sections, but how all the pieces come together is a much more difficult task. Therefore, one research project that may help to guide this process could be to follow the production of a single product all the way through the supply chain. The

advantage of this project would be the opportunity to talk directly with the experts along the way and ask questions specific to that process and how it relates to the rest of the industry. In practice, this would mean having lengthy interviews with the experts. Doing this will provide you with several areas to follow-up on that may be outside of the supply chain (industry associations, academia, organizations, government) and eventually piece together the puzzle that is an innovation system. Really this process would need to happen numerous times, following several different products and different leads to result in any kind of comprehensive description of Oregon's forest sector innovation system.

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Appendices

Appendix A: Interview Protocol

Interview Protocol

The objective of this interview is to expand my knowledge of Oregon's forest sector, how it works and how to enhance innovation. I would like to gain the best understanding possible before I develop a questionnaire and conduct a survey during the next phase of my research.

The specific objectives of my study are:

- Identify public and private organizations involved with Oregon's forest sector, as well as other major actors.
- Identify major local, state, and federal policies and incentives related to forest sector manufacturers.
- Clarify the roles and responsibilities of key organizations, policies and incentives.
- Identify prime opportunities and barriers to increasing innovation in the manufacturing sector, and develop recommendations for overcoming these barriers.

The following questions were developed to guide the conversation towards the desired information.

1. How do you define innovation?
2. Are you aware of any recent industry innovations? If so, where are they coming from?
3. In your opinion, how could Oregon's forest sector be more innovative?
4. What are some major constraints to being innovative within the forest sector?
5. What, or who, are the main enablers of innovation in Oregon's forest sector?
6. What qualities do these enablers possess that allow them to promote innovation?
7. Between which industry entities do you see most innovative collaborations occurring?
8. Who most often approaches you with innovative ideas? How often does that occur? How do you handle it?
9. Are there any incentives, monetary or other, for manufacturers to implement more innovative practices?
10. How important is government support in the form of an innovation policy or incentive for Oregon's forest sector?
11. What government policies do you know of that have encouraged innovation in Oregon's forest sector? And how have they encouraged innovation?

Are they local? State? Federal?

12. What sort of innovation policy would you like to see implemented to encourage innovation in Oregon's forest sector?
13. How might the implementation of a new innovation policy effect small versus large manufacturers in Oregon's forest sector?
14. How might the implementation of a new innovation policy effect manufacturers east of the cascades versus manufacturers west of the cascades?
15. What are other private organizations or foundations doing to promote innovation in Oregon's forest sector?
And what is their role in the innovative success of the industry?

Appendix B: Survey Cover Letter

Nadine C. Orozco
Oregon State University, 119 Richardson Hall
Corvallis OR, 97331
E nadine.orozco@oregonstate.edu

ID#

First Last Name,

You are receiving this questionnaire as part of my graduate research project in the College of Forestry at Oregon State University. **The objective of this research is to better understand innovation within Oregon's forest sector.**

Completing the questionnaire should take less than 10 minutes of your time. **Your response to this questionnaire is important for the success of this project.**

Please complete the questionnaire and return it in the envelope provided, or fax to (541)737-3385. The information you provide will be held in strict confidence. The number on the questionnaire is for administrative purposes and allows us to remove your name from the mailing list upon receipt of your response.

Please return by March 23, 2011. If a response is not received by this date, a second questionnaire will be sent.

If you have any questions, please contact:

Myself – nadine.orozco@oregonstate.edu, or

My Advisor – Eric Hansen – eric.hansen2@oregonstate.edu, or (541)737-4240

We appreciate your willingness to participate and thank you for your time.

Sincerely,

Nadine Orozco

MS Student

College of Forestry

Appendix C: Questionnaire

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Innovation in Oregon's Forest Sector

This questionnaire is part of a project investigating innovation in Oregon's forest industry. One way of facilitating innovation is through state and federal assistance programs. The questions that follow primarily address your familiarity and/or use of these programs. Your participation is extremely important to the success of this research.

- Completing the questionnaire should take approximately 5-10 minutes.
- Your responses will be held in strict confidence.
- To obtain study results, provide your email below or include your business card with your return. _____

1. Which of the following best describes your business? (Please choose one)

- | | |
|--|---|
| <input type="checkbox"/> Sawmill | <input type="checkbox"/> Wood Preserving |
| <input type="checkbox"/> Millwork, Cabinets & Furniture | <input type="checkbox"/> Plywood & Engineered Wood Products |
| <input type="checkbox"/> Residues (bark, sawdust, shavings) | <input type="checkbox"/> Boxes & Pallets |
| <input type="checkbox"/> Prefabricated Buildings | <input type="checkbox"/> Trusses |
| <input type="checkbox"/> Reconstituted Wood Product
(particleboard, MDF, hardboard) | <input type="checkbox"/> Other: _____ |

2. How many people were employed by your firm at the end of 2011?

- | | | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 1-19 | 20-49 | 50-99 | 100-249 | 250-500 | 500+ |
| <input type="checkbox"/> |

3) Has your company utilized any of the following state programs in the last five years?

	Yes	No, but aware of the program	No, <u>unaware</u> of the program
Oregon Angel Fund (OAF)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Biomass-to-Energy Installations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Business Development Assistance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Biomass Producer or Collector Tax Credits	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
State Energy Loan Program (SELP)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Business Energy Tax Credits	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dependent Care Tax Credit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4) Has your company utilized any other state programs in the last five years? Yes No If yes, which?

5) Has your company utilized any of the following programs provided by Business Oregon in the last five years?

	Yes	No, but aware of the program	No, <u>unaware</u> of the program
Oregon Investment Advantage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Strategic Investment Program (SIP)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Oregon Business Development Fund (OBDF)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entrepreneurial Development Loan Fund (EDLF)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Building Opportunities for Oregon Small Business Today (BOOST)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rural Renewable Energy Development (RRED) Zones	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
International Export Assistance Program	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Oregon Industrial Development Bonds	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Oregon Capital Access (CAP) Program	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Oregon's Enterprise Zones	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6) Has your company utilized any other programs provided by Business Oregon in the last five years? Yes No
If yes, which?

7) Has your company utilized any of the educational or technical resources provided by the following organizations in the last five years?

	Yes	No, but aware of the program	No, <u>unaware</u> of the program
Oregon BEST	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Industry Associations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Economic Development District (EDD)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Small Business Development Centers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Oregon Department of Education (ODE)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Oregon Forest Resources Institute (OFRI)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Oregon Manufacturing Extension Partnership	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Service Corps of Retired Executives (SCORE)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Oregon Wood Innovation Center (OWIC)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Oregon Department of Forestry (ODF)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Oregon State University (OSU)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other State Universities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Community Colleges	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8) Has your company utilized resources provided by any other organization in the last five years? Yes No
If yes, which?

9) Has your company (Oregon operations) utilized any of the following federal programs in the last five years?

	Yes	No, but aware of the program	No, <u>unaware</u> of the program
Microloan Program	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Export Express Program	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
International Trade Loan Program	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Export Working Capital Program (EWCP)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Small Business Innovation Research (SBIR)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Business and Industry Guaranteed Loans (B&I)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Small/Rural Lender Advantage (S/RLA) initiative	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
US Forest Service Woody Biomass Utilization Grant	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rural Energy for America Program Guaranteed Loan Program (REAP LOANS)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SBA Certified Development Company 504 Program	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Innovation Ecosystem Development Initiative	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Small Business Technology Transfer (STTR)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Biomass Crop Assistance Program (BCAP)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Intermediary Relending Program (IRP)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Repowering Assistance Program	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
REAP/Feasibility Grant Program	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

10) Has your company (Oregon operations) utilized any other federal programs in the last five years? Yes No
 If yes, which?

11) If "No, unaware of the program" was selected in any of the above boxes, what could be done to increase awareness?

12) What, if any, are your organization's major constraints to being innovative?

13) What, if any, are the forest products industry's major constraints to being innovative?

14) Does your company actively participate in collaborations to improve your business? If yes, with what type of organization?

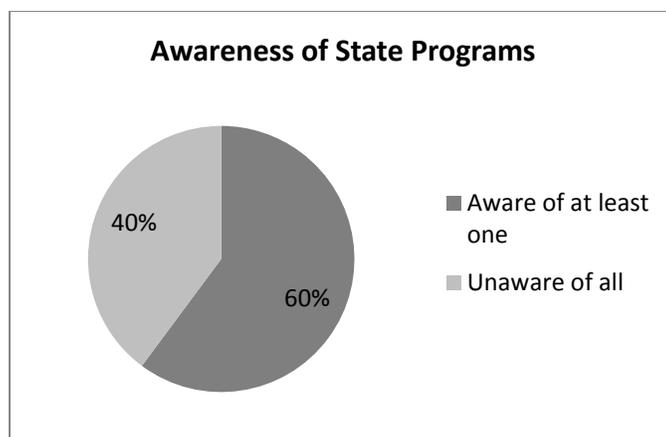
15) Considering your company, indicate to what extent you agree/disagree with the following statements:

	Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree
My company actively seeks innovative ideas	1	2	3	4	5
Innovation is readily accepted in my company	1	2	3	4	5
People are penalized for new ideas that don't work	1	2	3	4	5
Innovation in my company is encouraged	1	2	3	4	5

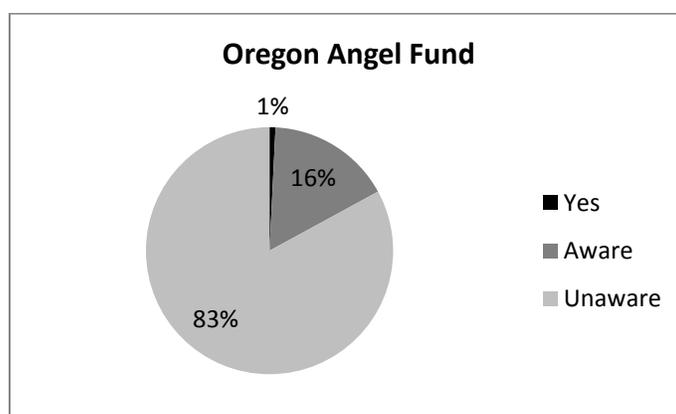
16) For your company as a whole, please indicate how your innovation efforts are allocated among the following types of innovation:

_____ %	Product Innovation - creation and/or adoption of new and/or improved products
_____ %	Process Innovation – creation and/or adoption of new and/or improved manufacturing processes.
_____ %	Business Systems Innovation - creation and/or adoption of new and/or improved methods of business management.
100%	Total Innovation Efforts

Appendix D: Specific Results of each State Incentive Program

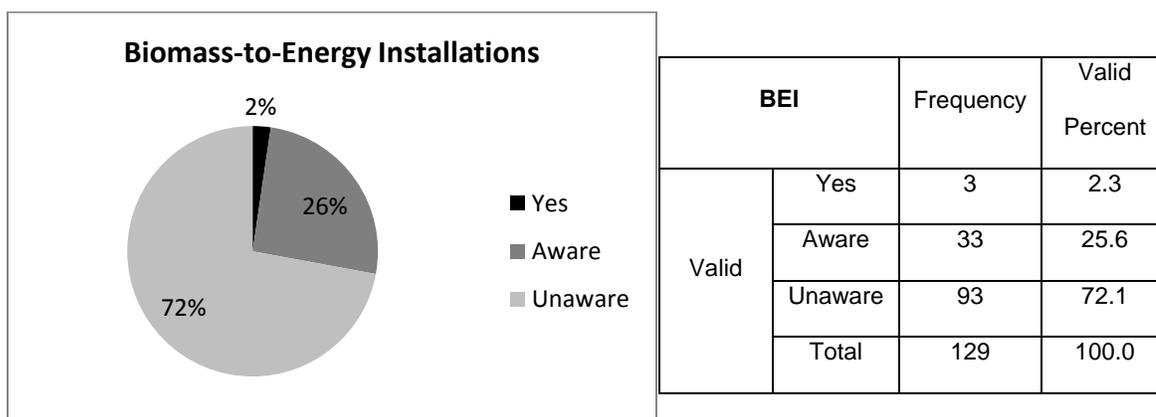


State Programs		Frequency	Valid Percent
Valid	Aware of at least one	77	60.2
	Unaware of all	51	39.8
Total		128	100.0

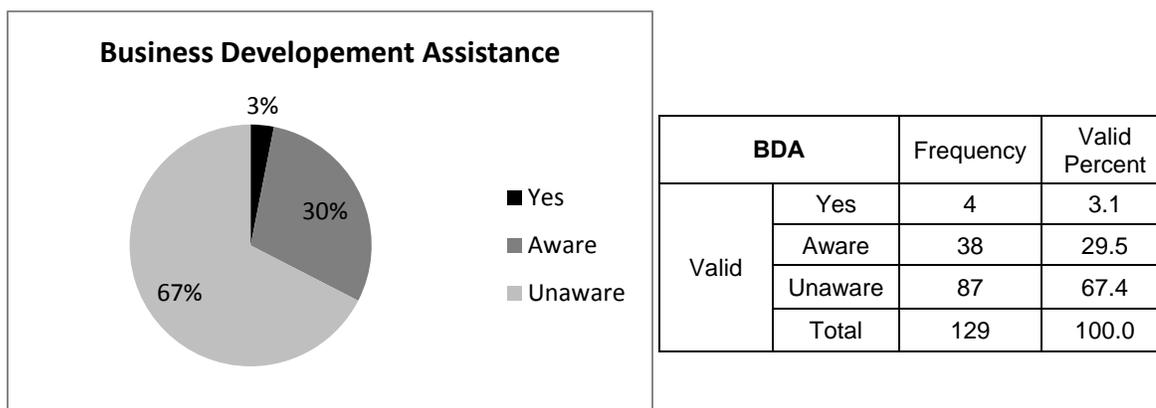


OAF		Frequency	Valid Percent
Valid	Yes	1	.8
	Aware	21	16.3
	Unaware	107	82.9
	Total	129	100.0

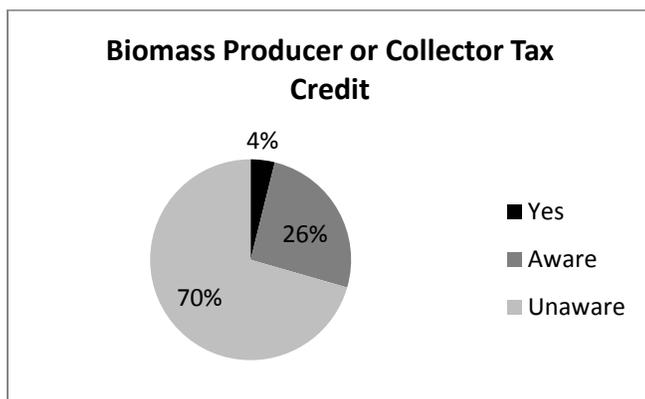
The Oregon Angel Fund (OAF) is provided by the Oregon Entrepreneurs Network and helps connect investors to promising startups and early-stage growth companies in Oregon and SW Washington. “OAF launches a new \$3M+ fund each spring. Each annual fund aims to place 4-5 investments over a 12-month active investing period. The fund typically invests \$400k-\$600k per deal with individual members and venture capitalists investing alongside and after OAF.” For more information visit: http://www.oen.org/programs_oaf.aspx.



“If your business manages organic waste such as organic solid waste, wastewater, agricultural wastes or wood residue, Energy Trust can help fund projects that use these organic wastes (biomass) to generate clean, renewable power. Energy Trust offers cash incentives for investing in biopower electricity generation systems. Incentive levels are based on a project’s above-market costs. There is no cap or fixed percentage of the amount of above-market costs we will pay. In return for our contribution, we ask for a negotiated share of the project’s Renewable Energy Certificates, which are held in trust for the ratepayers who contribute to Energy Trust. All projects must be less than 20MW in nameplate capacity and must deliver power to either Portland General Electric or Pacific Power in Oregon.” For more information visit: <http://energytrust.org/industrial-and-ag/incentives/other/biopower/Biopower/>

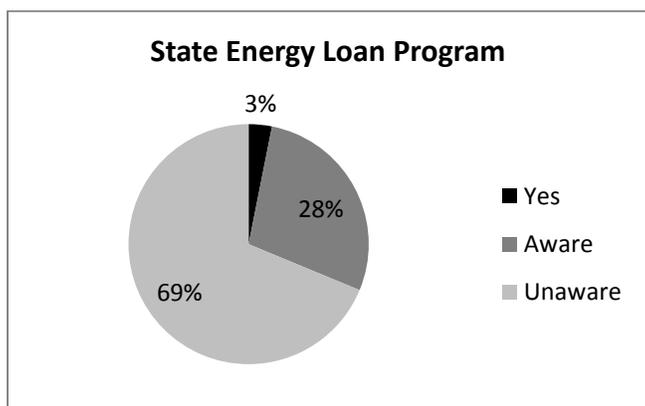


“Business outreach services are a primary focus of the Oregon Economic & Community Development Department. This department works with private, non-profit and government sources to foster an environment that encourages growing companies from start-up to success as strong and competitive entities in our global economy. It primarily focuses on four strategic areas - networking and awareness, capital, education and public policy and taxes.” For more information visit: http://filinginoregon.com/pages/business_registry/info_center/oecdd.html



BPCTC		Frequency	Valid Percent
Valid	Yes	5	3.9
	Aware	33	25.6
	Unaware	91	70.5
	Total	129	100.0

“The State of Oregon provides tax credits for the production, collection and transportation of biomass that is used for energy production. To be eligible for this credit, an applicant must be an agricultural producer or biomass collector and the biomass material must be sourced from within Oregon. In addition, the biomass must be used as biofuel or to produce biofuel in Oregon. Applications for tax credits must be received no later than 45 days following the end of the tax year.” For more information visit: <http://www.oregon.gov/energy/RENEW/Biomass/Pages/TaxCdt.aspx>



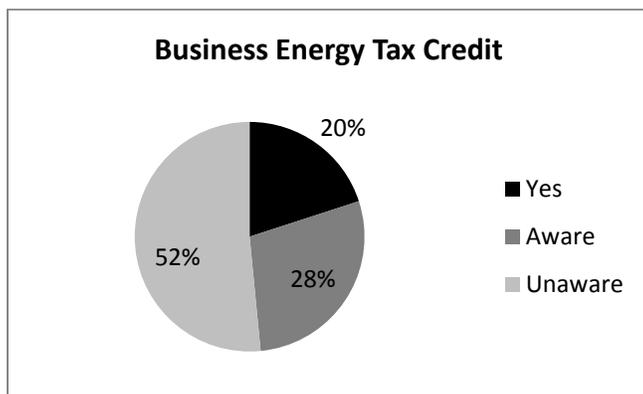
SELP		Frequency	Valid Percent
Valid	Yes	4	3.1
	Aware	36	28.1
	Unaware	88	68.8
	Total	128	100.0

“The purpose of the Energy Loan Program (also known as SELP) is to promote energy conservation and renewable energy resource development. The program offers low-interest loans for projects that:

- Save energy
- Produce energy from renewable resources such as water, wind, geothermal, solar, biomass, waste materials or waste heat
- Use recycled materials to create products
- Use alternative fuels

The Energy Loan Program can loan to individuals, businesses, schools, cities, counties, special districts, state and federal agencies, public corporations, cooperatives, tribes, and

non-profits. Projects must be primarily in Oregon.” For more information visit:
<http://www.oregon.gov/energy/LOANS/Pages/selphm.aspx>



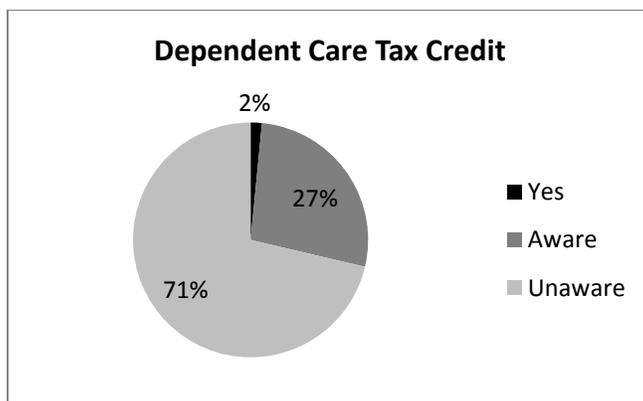
BETC		Frequency	Valid Percent
Valid	Yes	26	20.0
	Aware	37	28.5
	Unaware	67	51.5
	Total	130	100.0

“Oregon Laws, 2010, Chapter 76, Section 2 limits the amount of potential tax credits for facilities (projects) using or producing renewable energy resources or listed as renewable energy resources under ORS 469.185 to \$300 million for the biennium ending June 30, 2011. To meet these limits, ORS 469.195(2) established a tiered priority system and the criteria that the Oregon Department of Energy (Department) Director may consider in deciding whether to grant a Business Energy Tax Credit (BETC) for these facilities. The statute requires the Director to subject facilities with higher projected costs to closer scrutiny and compare facilities of similar costs against each other.

To be eligible to apply an applicant must meet the following requirements:

- Be a trade, business or rental property owner with a business site in Oregon **or** be an Oregon non-profit organization, tribe, or public entity that partners with an Oregon business or resident;
- Own or be the contract buyer of the facility; and
- Use the equipment or lease it to another person or business in Oregon; and
- Not have started physical construction; and
- Must complete the facility and receive final certification before by July 1, 2012”

(<http://www.oregon.gov/energy/cons/bus/pages/tax/betc-renewables.aspx>).



DCTC		Frequency	Valid Percent
Valid	Yes	2	1.6
	Aware	35	27.1
	Unaware	92	71.3
	Total	129	100.0

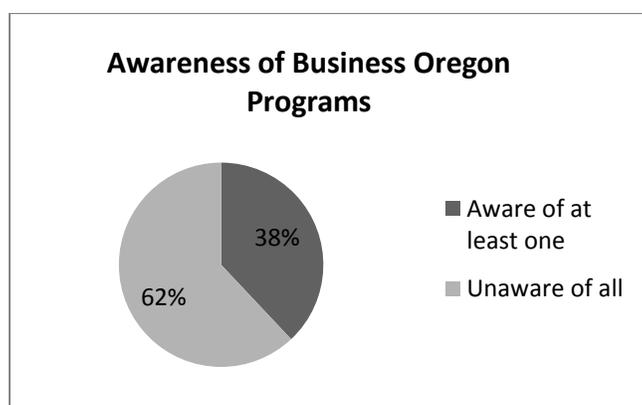
“Oregon is among 20 states in the nation that offer a state tax credit for dependent care assistance provided to employees. Oregon’s tax credit permits an employer to offset 50 percent of its child care expenditures against its state tax liability. The credit allows an annual limit of \$2,500 per employee.

The state tax credit for child care applies to these costs:

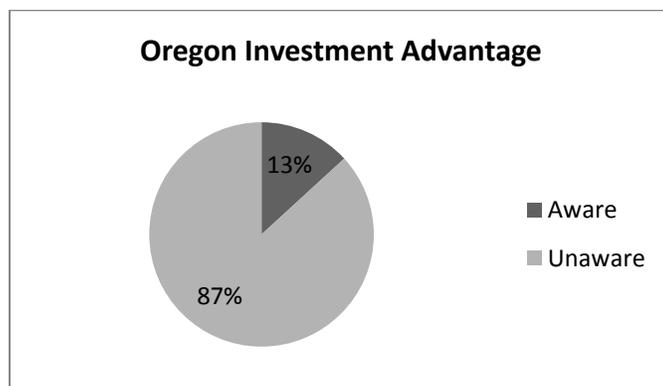
- Contracting with a third-party child care provider;
- Purchasing employees’ child care through payments to a third-party child care provider;
- Providing direct subsidies or vouchers to employees; and
- Contracting for child care resource and referral services”

For more information visit: <http://www.oregon.gov/EMPLOY/CCD/taxcredits.shtml>

Appendix E: Specific Results of each Business Oregon Incentive Program

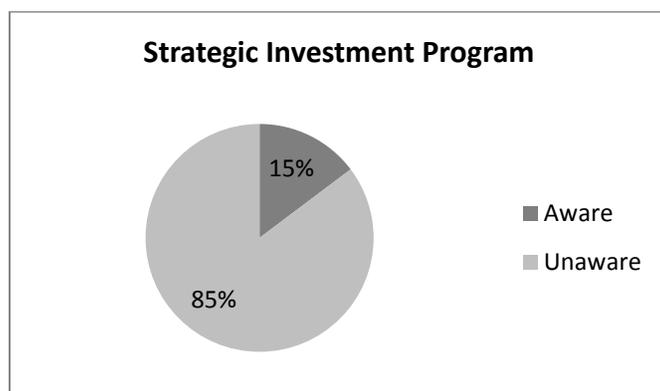


Business Oregon		Frequency	Valid Percent
Valid	Aware of at least one	49	38.0
	Unaware of all	80	62.0
	Total	129	100.0



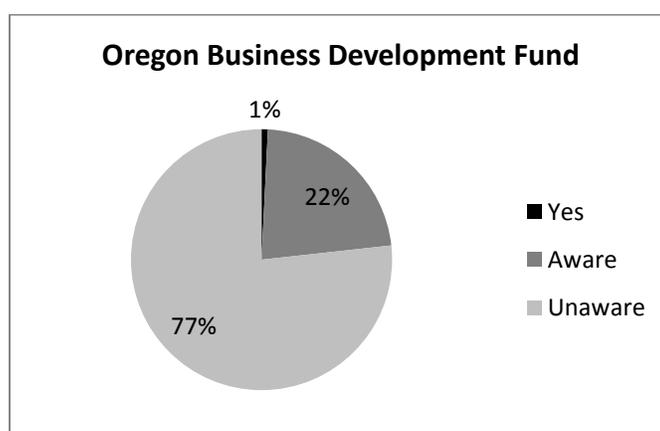
OIA		Frequency	Valid Percent
Valid	Aware	17	13.2
	Unaware	112	86.8
	Total	129	100.0

“This income tax exemption program helps businesses start or locate in a number of Oregon counties by providing a multi-year deduction for all income-based taxes related to the new business operations, potentially eliminating state business tax liability during that multi-year period.” For more information visit: <http://www.oregon4biz.com/The-Oregon-Advantage/Incentives/>



SIP		Frequency	Valid Percent
Valid	Aware	19	14.7
	Unaware	110	85.3
	Total	129	100.0

“The Strategic Investment Program (SIP) exempts a portion of large capital investments from property taxes. The program is available statewide for projects developed by "traded-sector" businesses, most often used for manufacturing firms. "Traded sector" is defined in Oregon law as "industries in which member firms sell their goods or services into markets for which national or international competition exists. Depending on the investment size, the Strategic Investment Program can offer exceptional benefits in terms of net present value.” For more information visit: <http://www.oregon4biz.com/The-Oregon-Advantage/Incentives/Strategic-Investment-Program/>

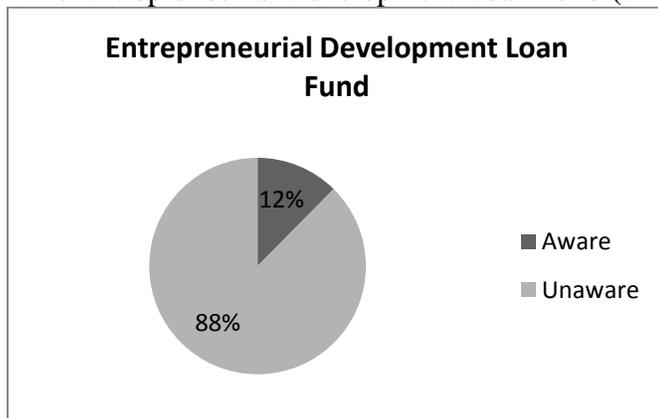


OBDF		Frequency	Valid Percent
Valid	Yes	1	.8
	Aware	29	22.5
	Unaware	99	76.7
	Total	129	100.0

“The Oregon Business Development Fund (OBDF) is a revolving loan fund that provides term fixed-rate financing for land, buildings, equipment, machinery and permanent working capital. Participants must create or retain jobs and must typically be a traded-sector business in manufacturing, processing or distribution. The program gives preference to projects located in rural and distressed areas and to small businesses with fewer than 100 employees.” For more information visit:

<http://www.oregon4biz.com/Business-financing-resources/Oregon-Finance-Programs/Oregon-Business-Development-Fund/>

“The Entrepreneurial Development Loan Fund (EDLF) pro



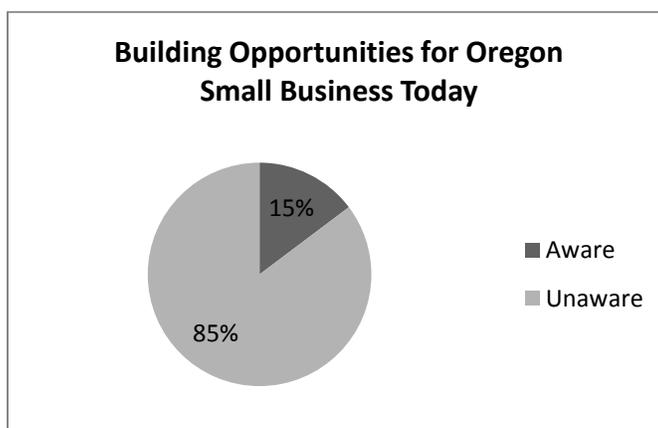
EDLF		Frequency	Valid Percent
Valid	Aware	16	12.4
	Unaware	113	87.6
	Total	129	100.0

vides direct loans to help start-ups, micro-enterprises and small businesses expand or become established in Oregon. This fund fills a niche not provided through traditional lending markets.

Participants must meet one, or both, of the following criteria:

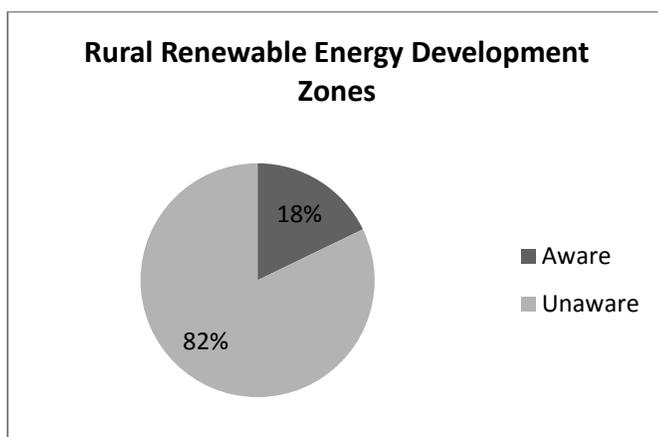
- have revenues of less than \$500,000 in the previous 12 months or
- be a business owned by a severely disabled person.”

For more information visit: <http://www.oregon4biz.com/Business-financing-resources/Oregon-Finance-Programs/Entrepreneurial-Development-Loan-Fund/>



BOOST		Frequency	Valid Percent
Valid	Aware	19	14.7
	Unaware	110	85.3
	Total	129	100.0

BOOST “is designed to promote better access to working capital that results in immediate job growth and job retention. Business Oregon will provide small businesses with both loans for businesses seeking permanent working capital, and grants for businesses that can create new, permanent full-time jobs here in Oregon.” For more information visit: <http://www.oregon4biz.com/news.php?a=34>

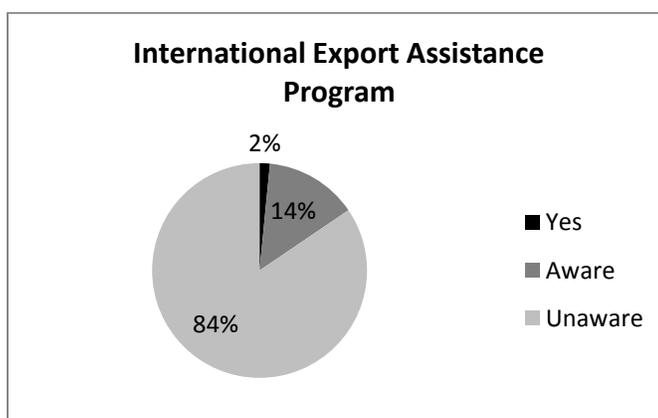


RRED		Frequency	Valid Percent
Valid	Aware	23	17.8
	Unaware	106	82.2
	Total	129	100.0

“Rural Renewable Energy Development (RRED) Zones offer an incentive to encourage investments that either:

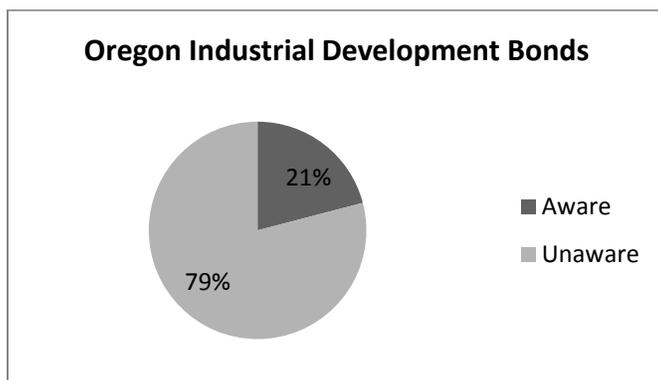
- Harness wind, geothermal, solar, biomass or other unconventional forms of energy in Oregon to generate electricity, or
- Produce, distribute or store any of a wide variety of biofuels.”

For more information visit: <http://www.oregon4biz.com/The-Oregon-Advantage/Incentives/Renewable-Energy-Zones/>



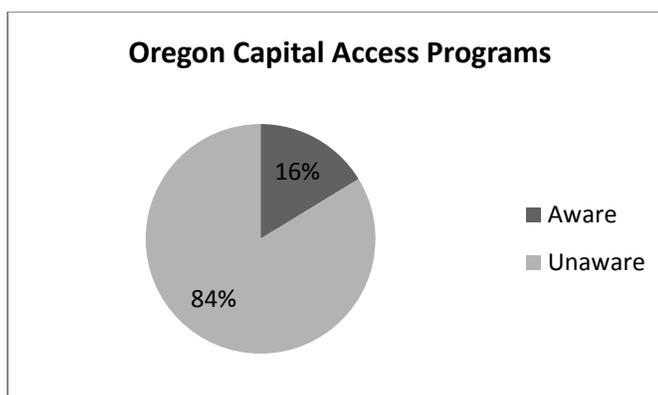
IEAP		Frequency	Valid Percent
Valid	Yes	2	1.6
	Aware	18	14.0
	Unaware	109	84.5
	Total	129	100.0

“Business Oregon's Global Strategies team helps Oregon businesses access global markets to enhance Oregon's position in the global economy. In cooperation with state, local and federal partners, Business Oregon helps small- and medium-sized Oregon companies become exporters and helps existing exporters access new markets.” For more information visit: <http://www.oregon4biz.com/Grow-Your-Business/Export-assistance/>



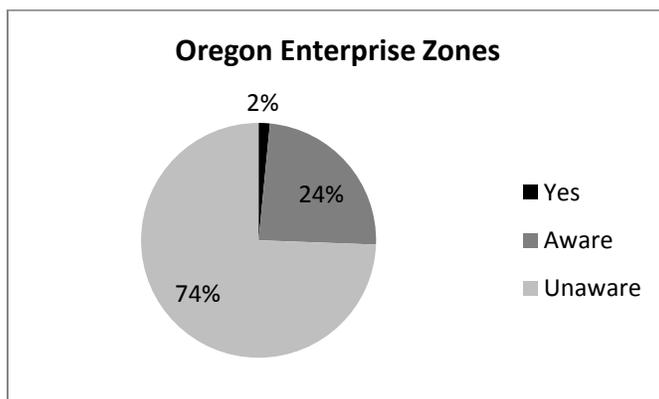
OIDB		Frequency	Valid Percent
Valid	Aware	27	20.9
	Unaware	102	79.1
	Total	129	100.0

“Oregon Industrial Development Bonds are tax-exempt bonds issued by the state of Oregon, designed to help Oregon manufacturers grow. They provide long-term financing for land, buildings and equipment. These bonds finance job creation and business growth for Oregon traded-sector, value-added manufacturers and processors by providing long-term debt financing for land, buildings and other fixed assets at a rate below prime. Affordable interest rates and tax-exempt status assist in lowering capital expenses. The bonds are available to manufacturers, processors, exempt facilities (e.g., docks or solid waste facilities) and nonprofits and generally provide the greatest benefit to the borrower for bonds of \$5 million or more.” For more information visit:
<http://www.oregon4biz.com/Business-financing-resources/Oregon-Finance-Programs/Oregon-Industrial-Development-Bonds/>



CAP		Frequency	Valid Percent
Valid	Aware	21	16.3
	Unaware	108	83.7
	Total	129	100.0

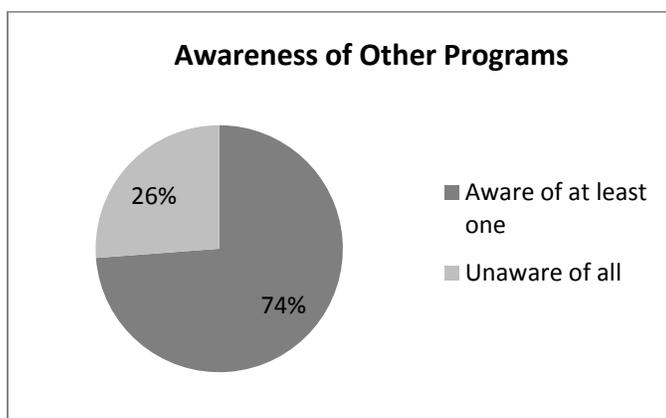
“The Oregon Capital Access (CAP) Program helps lenders (banks and credit unions) make more commercial loans to small businesses and provides capital for start-up or expansion. The program is designed for non-profit and for-profit businesses seeking funds for most business purposes. All types of loans and lines of credit are eligible. Lenders build a loan-loss reserve each time they enroll a loan. Contributions to the loan-loss reserve account are matched by Oregon Capital Access Program.” For more information visit:
<http://www.oregon4biz.com/Business-financing-resources/Oregon-Finance-Programs/Oregon-Capital-Access-Program/>



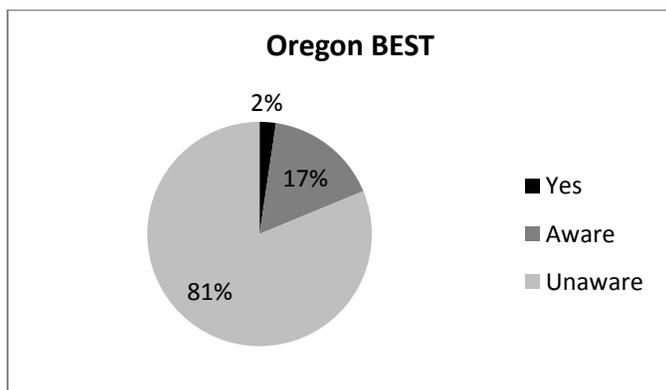
OEZ		Frequency	Valid Percent
Valid	Yes	2	1.6
	Aware	31	24.0
	Unaware	96	74.4
	Total	129	100.0

“In exchange for locating or expanding in an enterprise zone, businesses receive exemption from local property taxes on new plant and equipment for at least three years (but up to five years) in the standard program. In addition, some zones can offer special incentives for investments in long-term rural facilities or electronic commerce operations.” For more information visit: <http://www.oregon4biz.com/The-Oregon-Advantage/Incentives/>

Appendix F: Specific Results of Other Incentive Programs

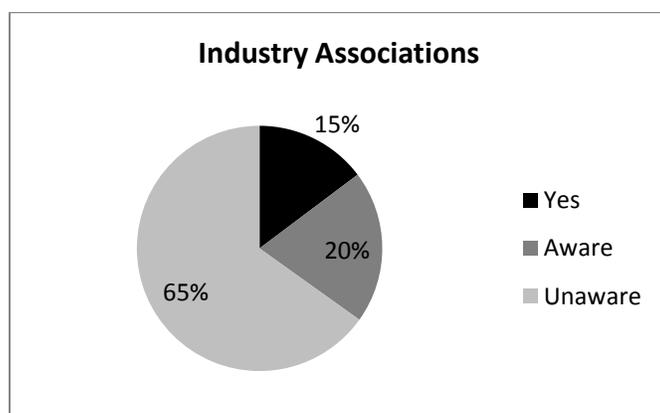


Other Resources		Frequency	Valid Percent
Valid	Aware of at least one	93	73.8
	Unaware of all	33	26.2
Total		126	100.0

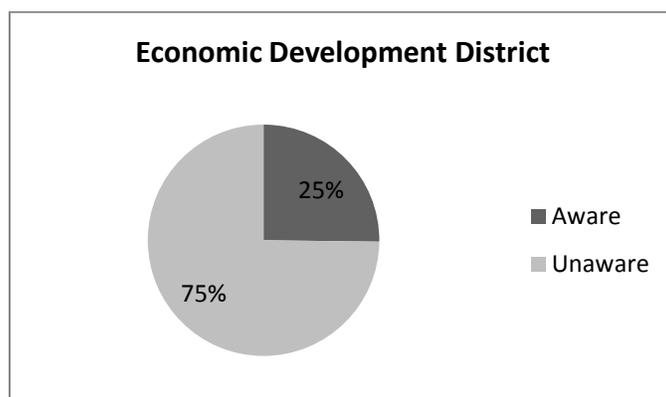


BEST		Frequency	Valid Percent
Valid	Yes	3	2.3
	Aware	21	16.4
	Unaware	104	81.3
	Total	128	100.0

“An independent, nonprofit established by the Oregon Legislature, Oregon BEST builds on Oregon’s reputation as an international leader in cleantech innovation. Our charter is to connect businesses and investors with our university-based network of shared-user lab facilities and faculty expertise to more efficiently commercialize cleantech research into on-the-ground products, services, and jobs that power Oregon's economy.” For more information visit: <http://oregonbest.org/about>

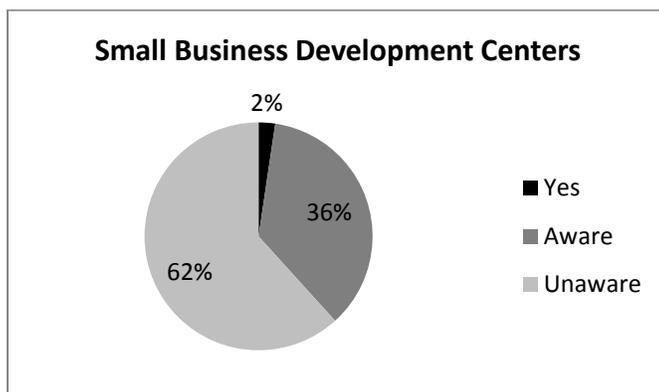


Ind. Assoc.		Frequency	Valid Percent
Valid	Yes	19	14.7
	Aware	26	20.2
	Unaware	84	65.1
	Total	129	100.0



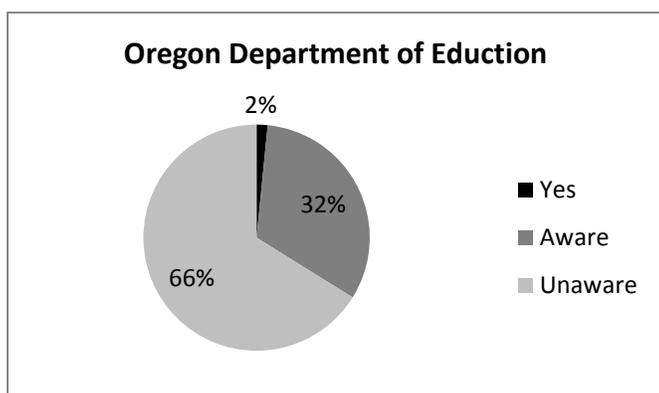
EDD		Frequency	Valid Percent
Valid	Aware	32	25.2
	Unaware	95	74.8
	Total	127	100.0

Economic Development Districts “work to provide effective, efficient delivery of economic development services benefiting healthy and sustainable communities and businesses. We operate regionally: forging strategies, solutions, and partnerships that achieve clear, quantifiable and tangible results, most of which would not have been feasible for a single local jurisdiction to implement. Like our counterparts nationwide, Oregon's Economic Development Districts manage and deliver an abundance of federal and state programs.” For more information visit: <http://www.oedd.org/>

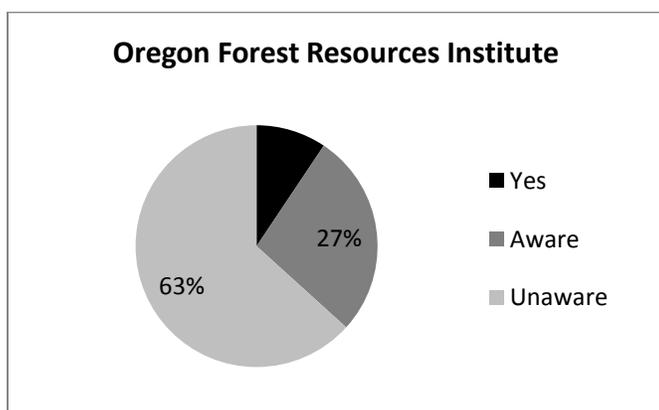


SBDC		Frequency	Valid Percent
Valid	Yes	3	2.3
	Aware	46	35.9
	Unaware	79	61.7
	Total	128	100.0

“Starting a business can be a challenge, but there is help for you in your area. Small Business Development Centers (SBDCs) are partnerships primarily between the government and colleges/universities administered by the Small Business Administration and aims at giving educational services for small business owners and aspiring entrepreneurs.” For more information visit: <http://www.sba.gov/content/small-business-development-centers-sbdcs>

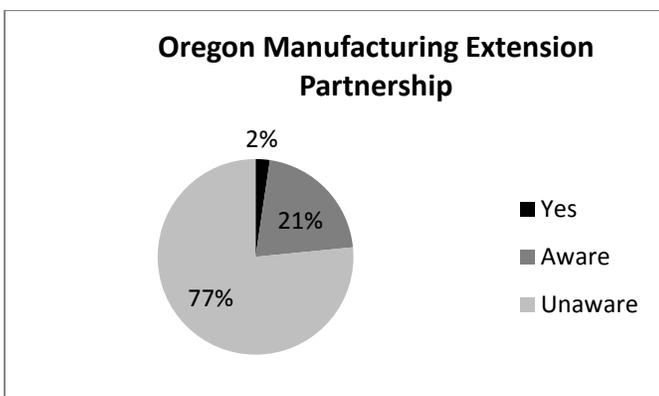


ODE		Frequency	Valid Percent
Valid	Yes	2	1.6
	Aware	41	32.3
	Unaware	84	66.1
	Total	127	100.0



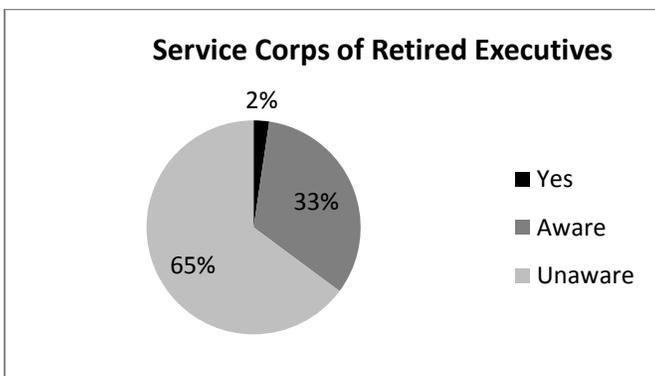
OFRI		Frequency	Valid Percent
Valid	Yes	12	9.4
	Aware	35	27.3
	Unaware	81	63.3
	Total	128	100.0

“Oregon’s forests are vast — and so too are the issues and challenges that impact their continued health and productivity. In 1991, the Oregon Legislature created the Oregon Forest Resources Institute (OFRI) to enhance collaboration among forest scientists, public agencies, community organizations, conservation groups and forest landowners; to provide objective information about responsible forest management; and to encourage environmentally sound forest practices through training and other educational programs. OFRI is a centralized gateway to shared ideas and collaborative dialogue regarding the delicate balance between the environmental, social and economic values provided by our forests. OFRI is funded by a dedicated harvest tax on producers of forest products.” For more information visit: <http://oregonforests.org/content/about-us>



OMEPEP		Frequency	Valid Percent
Valid	Yes	3	2.3
	Aware	27	21.1
	Unaware	98	76.6
	Total	128	100.0

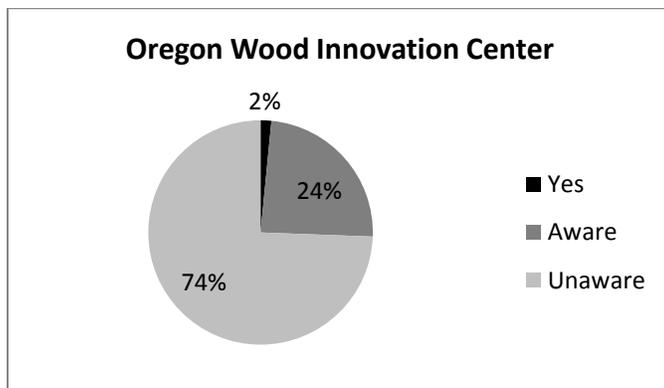
“OMEPEP is a non-profit organization that aims to help Oregon manufacturers respond to the challenges of competing in an increasingly global economy. We work with owners, executives, managers and operators to assess company needs in all areas. We move quickly from assessment to implementation to ensure that the company’s efforts provide an immediate payback. Regardless of our starting point, our goal is to unleashing a company's growth potential.” For more information visit: <http://www.omepep.org/what-we-do>



SCORE		Frequency	Valid Percent
Valid	Yes	3	2.3
	Aware	42	32.8
	Unaware	83	64.8
	Total	128	100.0

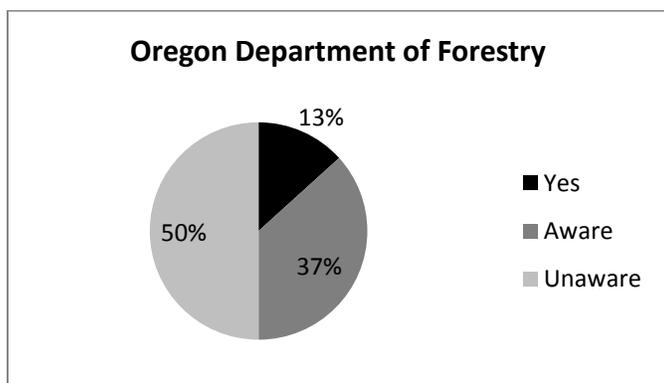
“SCORE is a nonprofit association dedicated to helping small businesses get off the

ground, grow and achieve their goals through education and mentorship. We have been doing this for nearly fifty years. Because our work is supported by the U.S. Small Business Administration (SBA), and thanks to our network of 13,000+ volunteers, we are able to deliver our services at no charge or at very low cost.” For more information visit: <http://www.score.org/about-score>

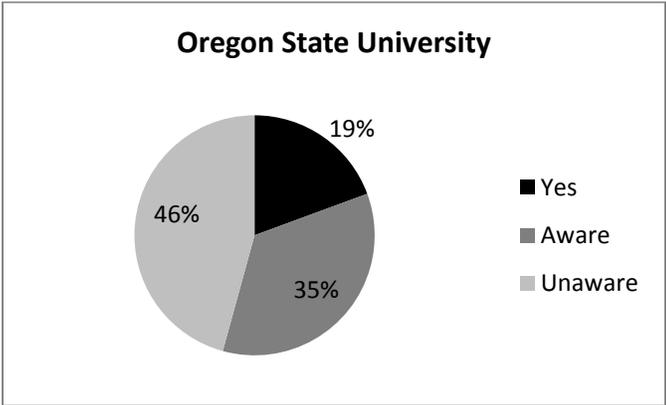


OWIC		Frequency	Valid Percent
Valid	Yes	2	1.6
	Aware	31	24.0
	Unaware	96	74.4
	Total	129	100.0

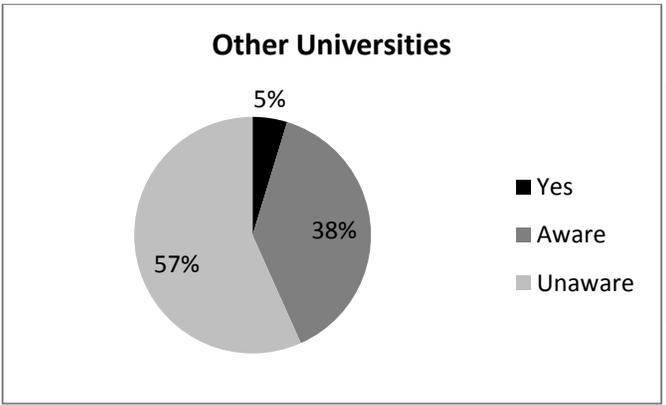
“Oregon State University’s College of Forestry and Extension Service have teamed up to create the Oregon Wood Innovation Center (OWIC). OWIC’s mission is to improve the competitiveness of Oregon’s wood products industry by fostering innovation in products, processes, and business systems. A key function of the Center is to serve as the primary link between university research and needs and opportunities in the forest industry.” For more information visit: <http://owic.oregonstate.edu/>



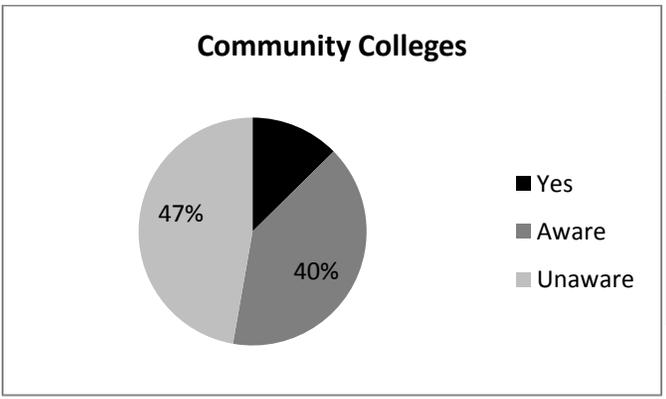
ODF		Frequency	Valid Percent
Valid	Yes	17	13.3
	Aware	47	36.7
	Unaware	64	50.0
	Total	128	100.0



OSU		Frequency	Valid Percent
Valid	Yes	25	19.4
	Aware	45	34.9
	Unaware	59	45.7
	Total	129	100.0

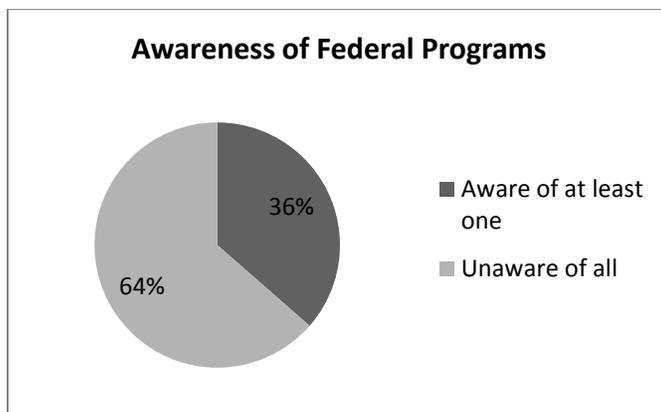


Other Univ.		Frequency	Valid Percent
Valid	Yes	6	4.7
	Aware	49	38.6
	Unaware	72	56.7
	Total	127	100.0

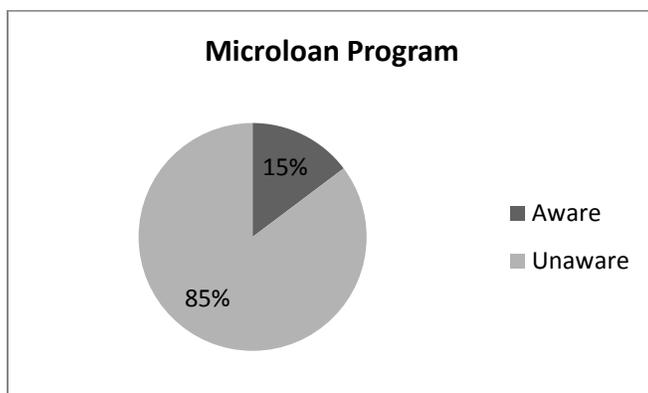


Comm. Colleges		Frequency	Valid Percent
Valid	Yes	16	12.6
	Aware	51	40.2
	Unaware	60	47.2
	Total	127	100.0

Appendix G: Specific Results of Federal Incentive Programs

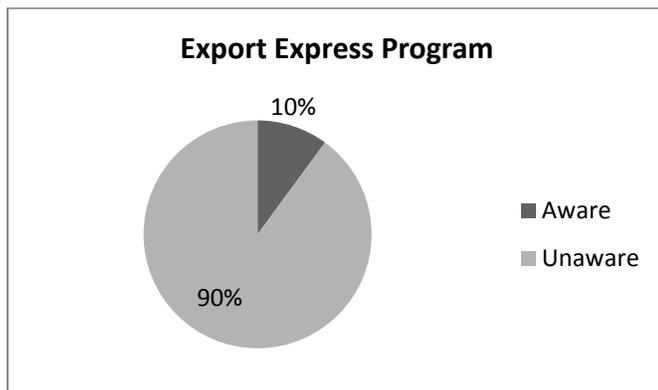


Federal Programs		Frequency	Valid Percent
Valid	Aware of at least one	47	36.4
	Unaware of all	82	63.6
	Total	129	100.0



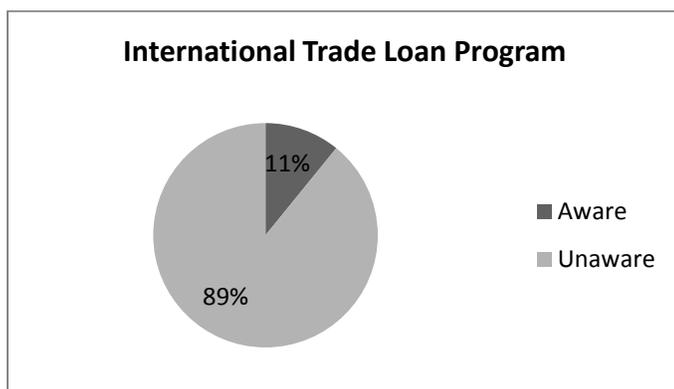
MP		Frequency	Valid Percent
Valid	Aware	19	14.7
	Unaware	110	85.3
	Total	129	100.0

“The Microloan Program provides small, short-term loans to small business concerns and certain types of not-for-profit child-care centers. The SBA makes funds available to specially designated intermediary lenders, which are nonprofit community-based organizations with experience in lending as well as management and technical assistance. These intermediaries make loans to eligible borrowers. The maximum loan amount is \$50,000, but the average microloan is about \$13,000.” For more information visit: <http://www.sba.gov/content/microloan-program>



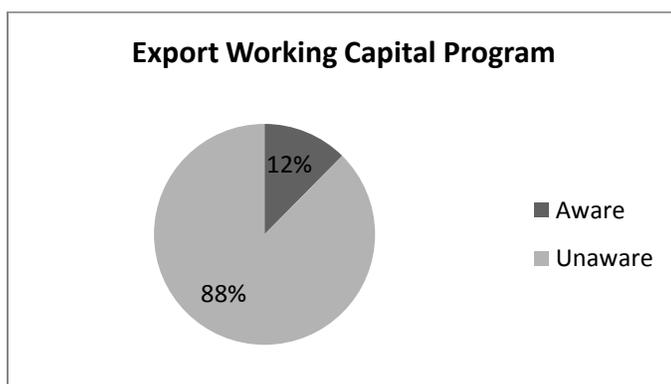
EEP		Frequency	Valid Percent
Valid	Aware	13	10.1
	Unaware	116	89.9
	Total	129	100.0

“Small business exporters are taking advantage of the world market and selling billions of dollars of goods and services overseas every year. In fact, 70% of all exporters have fewer than 20 employees. If you are one of these businesses, or would like to join in this growing trend, and you think you are too small to receive government sponsored export financing, think again! Any business that has been in operation, although not necessarily in exporting, for at least 12 full months and can demonstrate that the loan proceeds will support its export activity is eligible for Export Express.” For more information visit: <http://www.sba.gov/content/export-loan-programs#Export%20Express%20Program>



ITLP		Frequency	Valid Percent
Valid	Aware	14	10.9
	Unaware	115	89.1
	Total	129	100.0

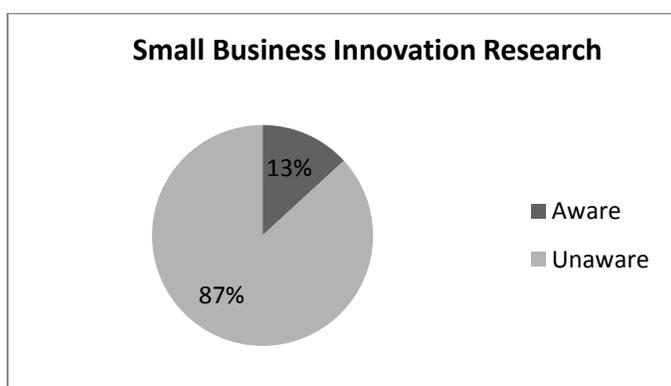
“The International Trade Loan Program offers term loans for fixed assets and working capital to businesses that plan to start or continue exporting, or that have been adversely affected by competition from imports and need to retool to become more competitive. The proceeds of the loan must enable the borrower to be in a better position to compete. The program provides the lender with a 90% guaranty on loans up to \$5 million. International Trade loans are available to small businesses that are in a position to expand existing export markets or develop new export markets, or small businesses that have been adversely affected by international trade and can demonstrate that the loan proceeds will improve their competitive position.” For more information visit: <http://www.sba.gov/content/export-loan-programs#International%20Trade%20Loan%20Program>



EWCP		Frequency	Valid Percent
Valid	Aware	16	12.4
	Unaware	113	87.6
	Total	129	100.0

“Many banks in the U.S. do not provide working capital advances on export orders, export receivables or letters of credit. Because of that, some small businesses may lack necessary export working capital to support their export sales. That is where an SBA program can make the difference. SBA provides lenders with up to a 90% guaranty on export loans up to \$5 million as a credit enhancement, so that the lenders will make the necessary export working capital available.

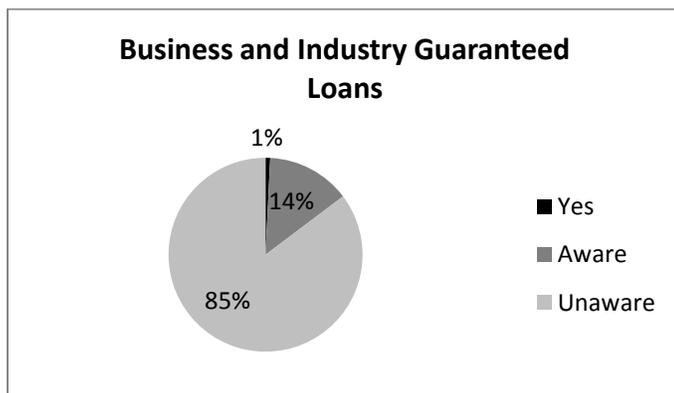
The SBA delivers its export loan program through a network of SBA Senior International Credit Officers located in U.S. Export Assistance Centers throughout the country. These specialists understand trade finance and are available to explain SBA’s export lending programs, the application process and forms and to guide exporters in selecting appropriate payment methods. They can also link companies to specialists for increasing export sales and managing foreign payment risk.” For more information visit: <http://www.sba.gov/content/export-loan-programs#Export%20Working%20Capital%20Program%20%28EWCP%29>



SBIR		Frequency	Valid Percent
Valid	Aware	17	13.2
	Unaware	112	86.8
	Total	129	100.0

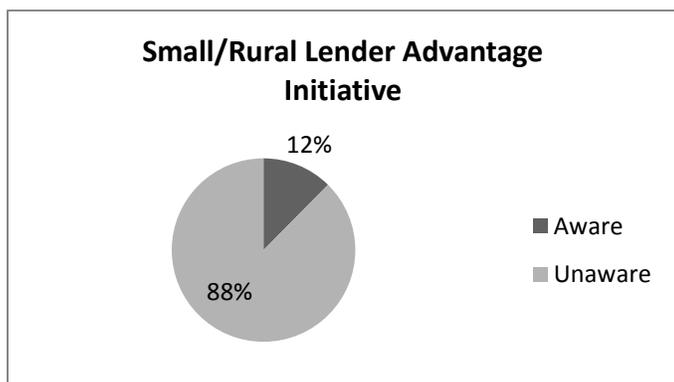
“The Small Business Innovation Research (SBIR) program is a highly competitive program that encourages domestic small businesses to engage in Federal Research/Research and Development (R/R&D) that has the potential for commercialization. Through a competitive awards-based program, SBIR enables small businesses to explore their technological potential and provides the incentive to profit from its commercialization. By including qualified small businesses in the nation's R&D

arena, high-tech innovation is stimulated and the United States gains entrepreneurial spirit as it meets its specific research and development needs.” For more information visit: <http://www.sbir.gov/about/about-sbir>



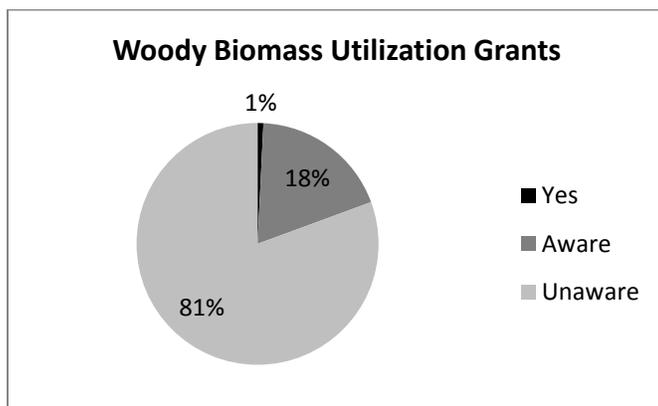
BI		Frequency	Valid Percent
Valid	Yes	1	.8
	Aware	18	14.0
	Unaware	110	85.3
	Total	129	100.0

“The purpose of the B&I Guaranteed Loan Program is to improve, develop, or finance business, industry, and employment and improve the economic and environmental climate in rural communities. This purpose is achieved by bolstering the existing private credit structure through the guarantee of quality loans which will provide lasting community benefits. It is not intended that the guarantee authority will be used for marginal or substandard loans or for relief of lenders having such loans.” For more information visit: http://www.rurdev.usda.gov/rbs/busp/b%26i_gar.htm



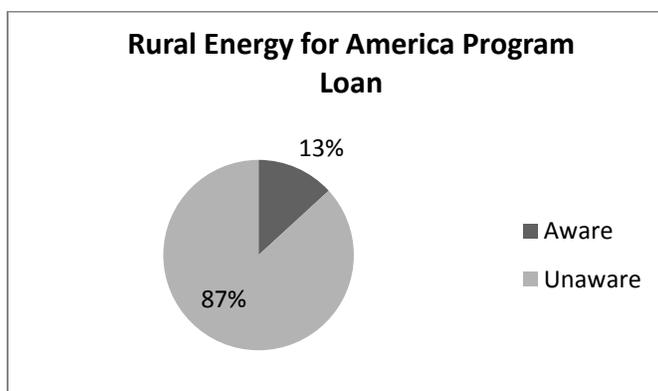
SRLA		Frequency	Valid Percent
Valid	Aware	16	12.4
	Unaware	113	87.6
	Total	129	100.0

“The Small/Rural Lender Advantage (S/RLA) initiative is designed to accommodate the unique loan processing needs of small community/rural-based lenders by simplifying and streamlining loan application process and procedures, particularly for smaller SBA loans. It is part of a broader SBA initiative to promote the economic development of local communities, particularly those facing the challenges of population loss, economic dislocation, and high unemployment.” For more information visit: <http://www.sba.gov/content/rural-business-loans>



WBUG		Frequency	Valid Percent
Valid	Yes	1	.8
	Aware	24	18.6
	Unaware	104	80.6
	Total	129	100.0

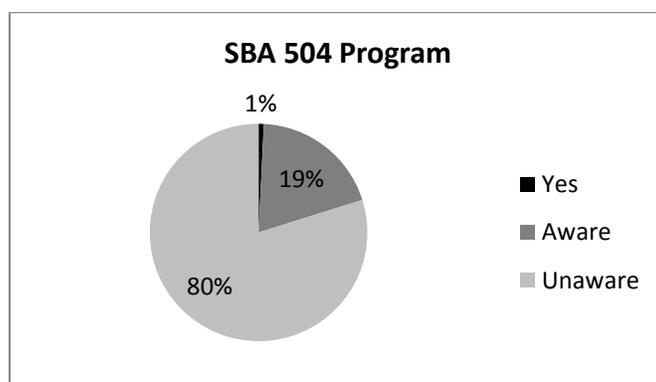
“The U.S. Forest Service, State and Private Forestry, Technology Marketing Unit, located at the Forest Products Laboratory, requests proposals for wood energy projects that require engineering services. These projects will use woody biomass material removed from forest restoration activities, such as wildfire hazardous fuel treatments, insect and disease mitigation, forest management due to catastrophic weather events, and/or thinning overstocked stands. The woody biomass shall be used in a bioenergy facility that uses commercially proven technologies to produce thermal, electrical or liquid/gaseous bioenergy. The funds from the Woody Biomass Utilization Grant program (WBU) must be used to further the planning of such facilities by funding the engineering services necessary for final design and cost analysis. Examples of such projects include engineering design of a 1) woody biomass boiler for steam at a sawmill, 2) non-pressurized hot water system for various applications at a hospital or school, and 3) biomass power generation facility, or similar facilities. This program is aimed at helping applicants complete the necessary design work needed to secure public and/or private investment for construction.”For more information visit:
<http://www07.grants.gov/search/synopsis.do;jsessionid=TXWhPBTYj249qxHMpcj0cRM72gpy2D7bTNczYFtLLqrM3pwJVGSY!363235014>



REAP Loan		Frequency	Valid Percent
Valid	Aware	17	13.2
	Unaware	112	86.8
	Total	129	100.0

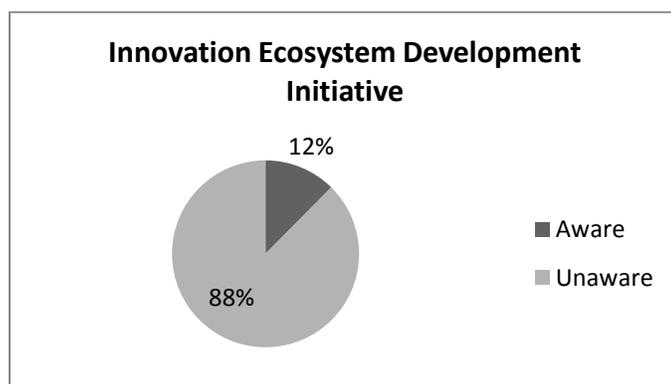
“REAP (Rural Energy for America Program, formerly known as the "\$9006" program) provides guarantees to commercial lenders on loans for the purchase and installation of

renewable energy generating systems or energy efficiency improvements. This assistance is limited to loan to small businesses and farmers & ranchers. Projects must be located in a rural area. REAP guaranteed loans may finance up to 75% of such a project. The maximum loan size eligible for a REAP guarantee is \$25 million.” For more information visit: <http://www.rurdev.usda.gov/or/reapgl.htm>



504 Program		Frequency	Valid Percent
Valid	Yes	1	.8
	Aware	25	19.4
	Unaware	103	79.8
	Total	129	100.0

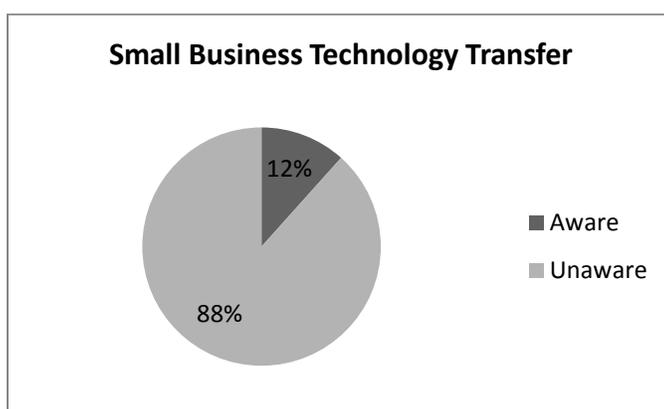
“The SBA 504 Loan program is a powerful economic development loan program that offers small businesses another avenue for business financing, while promoting business growth, and job creation. As of February 15, 2012, the \$50 Billion in 504 loans has created over 2 million jobs. This program is a proven success and win-win-win for the small business, the community and participating lenders. The 504 Loan Program provides approved small businesses with long-term, fixed-rate financing used to acquire fixed assets for expansion or modernization. 504 loans are made available through Certified Development Companies (CDCs), SBA's community based partners for providing 504 Loans.” For more information visit: <http://www.sba.gov/content/cdc504-loan-program>



IEDI		Frequency	Valid Percent
Valid	Aware	16	12.4
	Unaware	113	87.6
	Total	129	100.0

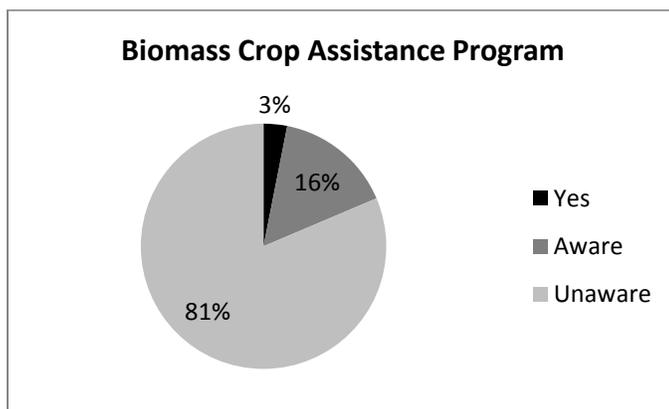
“In September 2010, the Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy (EERE) Commercialization Team made five three-year awards to five projects. The goal of the five projects is to build and strengthen "innovation ecosystems"

that accelerate the movement of cutting-edge energy efficiency and renewable energy technologies from university laboratories into the market. The five projects are led by universities and nonprofits located in five distinct geographic regions across the United States, and convene more than 80 project partners, uniting the strengths of universities, business, finance, government, research institutes, economic development organizations, accelerators, and national laboratories. The five projects will accomplish such activities as pursuing intellectual property protection for technological innovations; nurturing and mentoring entrepreneurs; engaging the surrounding business and venture capital community; and integrating sustainable entrepreneurship and innovation across university schools and departments.” For more information visit: http://techportal.eere.energy.gov/commercialization/initiatives/innovation_ecosystem_initiative



STTR		Frequency	Valid Percent
Valid	Aware	15	11.6
	Unaware	114	88.4
	Total	129	100.0

“Small Business Technology Transfer (STTR) is another program that expands funding opportunities in the federal innovation research and development (R&D) arena. Central to the program is expansion of the public/private sector partnership to include the joint venture opportunities for small businesses and nonprofit research institutions. The unique feature of the STTR program is the requirement for the small business to formally collaborate with a research institution in Phase I and Phase II. STTR's most important role is to bridge the gap between performance of basic science and commercialization of resulting innovations.” For more information visit: <http://www.sbir.gov/about/about-str>



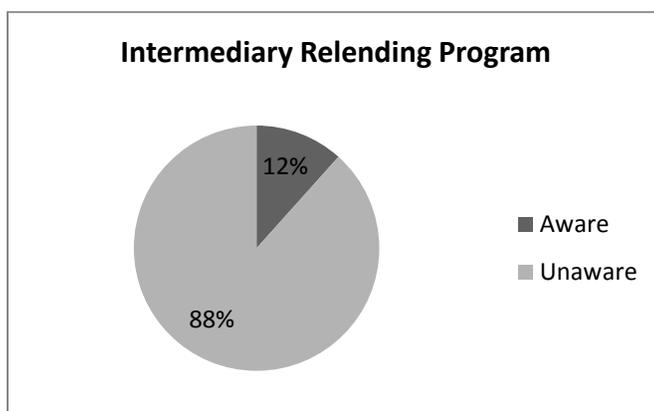
BCAP		Frequency	Valid Percent
Valid	Yes	4	3.1
	Aware	20	15.5
	Unaware	105	81.4
	Total	129	100.0

“The Biomass Crop Assistance Program (BCAP) provides financial assistance to owners and operators of agricultural and non-industrial private forest land who wish to establish, produce, and deliver biomass feedstocks. BCAP provides two categories of assistance:

- Matching payments may be available for the delivery of eligible material to qualified biomass conversion facilities by eligible material owners. Qualified biomass conversion facilities produce heat, power, biobased products, or advanced biofuels from biomass feedstocks.
- Establishment and annual payments may be available to certain producers who enter into contracts with the Commodity Credit Corporation (CCC) to produce eligible biomass crops on contract acres within BCAP project areas.”

For more information visit:

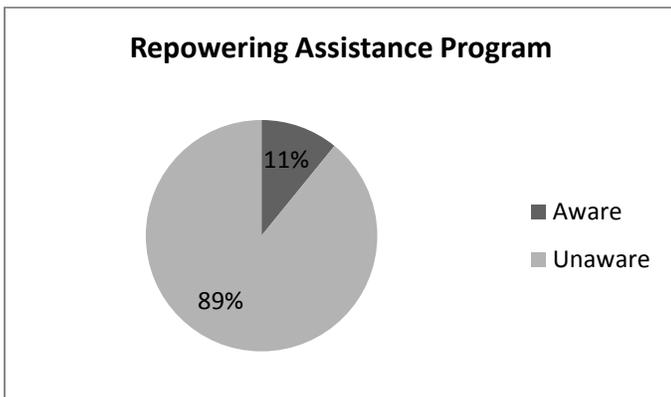
<http://www.fsa.usda.gov/FSA/webapp?area=home&subject=ener&topic=bcap>



IRP		Frequency	Valid Percent
Valid	Aware	15	11.6
	Unaware	114	88.4
	Total	129	100.0

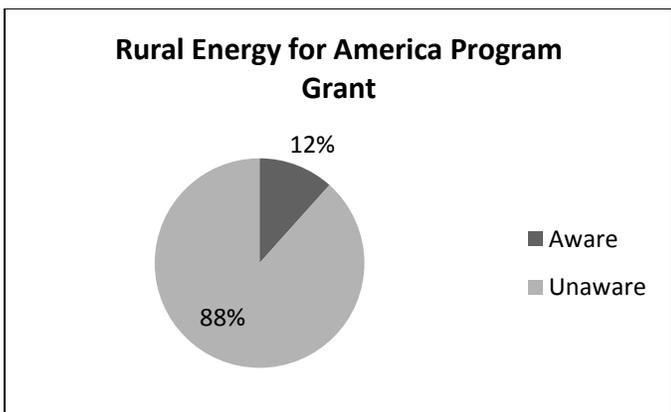
“The purpose of the IRP program is to alleviate poverty and increase economic activity and employment in rural communities. Under the IRP program, loans are provided to local organizations (intermediaries) for the establishment of revolving loan funds. These revolving loan funds are used to assist with financing business and economic development activity to create or retain jobs in disadvantaged and remote communities. Intermediaries are encouraged to work in concert with State and regional strategies, and

in partnership with other public and private organizations that can provide complimentary resources.” For more information visit: http://www.rurdev.usda.gov/BCP_irp.html



RAP		Frequency	Valid Percent
Valid	Aware	14	10.9
	Unaware	115	89.1
	Total	129	100.0

“The Repowering Assistance Program provides payments to eligible biorefineries to replace fossil fuels used to produce heat or power to operate the biorefineries with renewable biomass. It provides reimbursement payments to help offset the costs associated with converting existing fossil fuel systems to renewable biomass fuel systems. The program encourages the use of renewable biomass as a replacement fuel source for fossil fuels used to provide process heat or power in the operation of eligible biorefineries. The amount of assistance is determined by the availability of funds, the project scope, and the ability of the proposed project to meet all the scoring criteria. In particular, the percentage reduction in fossil fuel used by the biorefinery, the quantity of fossil fuels replaced by a renewable biomass system, and the cost effectiveness of the renewable biomass system.” For more information visit: http://www.rurdev.usda.gov/BCP_RepoweringAssistance.html



REAP Grant		Frequency	Valid Percent
Valid	Aware	15	11.6
	Unaware	114	88.4
	Total	129	100.0

“The REAP program provides grants to rural small businesses & agricultural producers for up to 25% of the cost to purchase & install renewable energy generation systems. Eligible applicants include rural small businesses – “Rural” means the project is not

located in a Census-defined Metropolitan Statistical Areas. “Small” is as defined by SBA and depends on business type – typically < 500 employees & revenue < \$6.5 million. SBA defines “small” power generators as producing < 4 million MW-hrs/yr; biofuel manufacturers with < 1,000 employees. Agricultural producers – individuals or business entities receiving at least 50% of gross income from agriculture.” For more information visit: http://www.rurdev.usda.gov/SupportDocuments/OR_BP_REAP_RESooverview.pdf

