Grantee Technology Transfer Checklist
Preface: Technology Transfer (TT) is clearly a process that's more business oriented than academic oriented. Intellectual criteria that make a project interesting in the context of an academic model are subordinate to economic criteria which require a project to be sound and profitable in the framework of a business model. No matter how great the need, not all prototypes result in viable products in the Assistive Technology (AT) marketplace. Market failures can often be traced back to activity preceding the prototype event. Improper assumptions by the researcher about consumer wants and needs, incorrect or missing information about markets, or the lack of awareness of parallel research by others that makes current work obsolete, can all lead to market failure. Barriers to successful TT arise at the earliest stages of research, even before a prototype is developed. Failure by researchers to consider and address those barriers early on will typically result in project failure.

The information provided identifies some of the barriers that proposal grant writers should be aware of and address as they draft and outline development projects that are a part of their grant proposal. The checklist also provides carriers that grant writers should use to overcome or mitigate barriers to their work. This listing, by all means, is not all encompassing. However, the KT4TT through its current knowledge base (http://kt4tt.buffalo.edu/knowledgebase/index.php), provides additional information on many other TT barriers and the carriers that researchers have used to mitigate or successfully overcome them in the past.

The following is adapted from a paper titled "Knowledge from Research and Practice on the Barriers and Carriers to Successful Technology Transfer for Assistive Technology Devices. It was published in Assistive Technology Outcomes and Benefits, Summer 2010, Volume 6, Number 1

Modeling the Product Development Process
For the purpose of this resource material, discussion of barriers, carriers, and standard practices should be considered in the context of TT processes at federally funded (U.S.) programs at universities where prototype development is followed by TT to corporations for product development.

The barriers, carriers, and standard practices discussed are the same, in some cases, as those encountered in standard new product development processes by corporations. However, because a university attempts to license a prototype invention to a company, the barriers, carriers, and standard practices are unique to university research communities and to universities attempting to license prototypes.

IDEA STAGE
Barriers to successful TT of an invention spring up at the earliest stages of research, even before a researcher develops an invention. If a researcher or inventor fails to meticulously consider and address these early barriers, the future product may fail downstream.

At this stage, the researcher knows of an unmet consumer need for a technology or a product. But at this point, the researcher is uncertain of exactly what to develop. He or she applies for a grant from a funding agency to do research to develop a technology that the researcher hopes will address the unmet need and become a usable product for consumers. Even at this stage, potential barriers that go unaddressed will lead to project failure.

**Barriers to Achieving a Valid Idea Critical Event**
*Failure to allocate an adequate amount of researcher’s time.* Here, if a researcher allocates only minimal time to the research project, for example, 5%-10% full-time effort, practically speaking, the project won’t receive enough attention to succeed (Lane, 2008).

*Failure to allocate adequate resources.* A researcher may allocate insufficient lab and financial resources to the project. If only one member of a research team works on a project, the future of the project is already in jeopardy. Similarly, if that individual leaves the team, it’s possible that the team’s remaining members would let the project fall by the wayside.

**Carriers that Can Nullify Barriers Prior to the Idea Stage**
Granting agencies or universities should see to it that federally funded investigators who perform research have allocated a substantial minimum amount of time to a research project. Generally, very low full-time effort allocation of a researcher’s time (5%-10%) results in project failure (Lane, 2008).

Allocation of adequate resources includes staff, facility, and consumer involvement time. While researchers may understand their laboratory and staff needs, researchers who fail to allocate sufficient financial resources to a consumer component of research (i.e., focus groups, surveys, etc.) may remain unaware of the full range of consumers’ needs, wants, and desires for a product solution. Researchers may incorrectly make assumptions about what is good for, necessary to, and desired by end consumers (Cooper, 1999).

Projects should be seeded with the efforts and interests of multiple researchers. Multiple investigators should contribute significant full-time effort. By this approach, a project can survive the departure of any single researcher (Lane, 2008).

**PROTOTYPE STAGE**
**Barriers and Carriers Between Idea and Prototype Critical Events**
After a researcher has applied for federal funding and university backing, product development literature shows that certain carriers and standard practices should be
performed by the research team at this early stage for research to result in invention, innovation, and, eventually, a viable commercial product. Failure to navigate potential barriers here significantly inhibits the project’s potential for success.

**Barriers to Progressing to the Prototype Critical Event**

*Lack of preliminary assessment.* Lack of due diligence by an inventor or research team could result in duplication of research and thus only minor or incremental improvements to technology and products that are already in the commercial marketplace. If the research team lacks awareness of the industry, of which technologies are being developed into commercial products, and of regulatory or business perspectives (i.e., device reimbursement issues, government accessibility regulations [such as those contained in Section 508 of the Rehabilitation Act], or the relocation of manufacturer production facilities overseas), their research will fail to lead to a development outcome of a product in the commercial marketplace.

*Failure to build the business case.*

AT markets are historically small. Unless research generates technology that can be used across markets, the cost of the technology will stunt its early acceptance and use by consumers. If the overall goal of a research project is to impact the lives of consumers, then awareness of the costs of technology is paramount. A decade ago the cost of the voice chips used in voice-interactive products was prohibitive, which delayed the arrival of many voice-operated products to the market. Today, as more product applications have appeared, and the technology to produce voice chips has become cheaper, the cost of voice-interactive products has decreased. These products are now viable commercially. Similarly, researchers may believe themselves to be experts in terms of both the technologies and products that are currently available as well as consumers’ needs. Therefore they will not perform due diligence requirements on an industry. They will also fail to assess consumer needs in detail.

**Carriers that Would Nullify Potential Barriers Between Idea and Prototype Stages**

*Perform preliminary assessments.* Researchers should perform an extensive search of regulatory standards, competing technology and products, and consumers or the target market to verify that their research will meet an existing need or solve a problem. Options include searching similar technologies, products, and patents. Researchers should contact industry associations in their areas of research to track current developments from manufacturing and regulatory standpoints. Researchers should interject consumer input early on and throughout the design process. The needs and wants of the target market for the product need to be identified as early as possible in the product development cycle so they may be addressed.

*Build the business case.*

Researchers should explore the technology costs and applications. Retailers and professionals may be visited to learn how individuals presently address the relevant function or need through products currently in the market. Inventors must also recognize that consumers sometimes prefer a technology-free option. Also, researchers need to
constantly search for disruptive technologies as this may negatively affect the acceptance and adoption of their work.

**Barriers and Carriers Between the Prototype and Product Critical Event**
The remainder of this paper focuses on technology transfer at U.S. federally funded programs where prototype creation occurs at universities with subsequent technology transfer to corporations for product development. Universities operate technology transfer offices (TTO) to ensure compliance with all institutional and federal regulations concerning intellectual property, such as the Bayh-Dole, Patent and Trademark Act Amendments of 1980. Research performed by university employees, on or off premises, and specifically all research performed on university property, utilizing university facilities that leads to an invention by a university employee must be disclosed to the university’s TTO. For inventions that result from federal funding, the TTO discloses the invention to the funding sponsor and determines if either the TTO or the sponsor elects to lay claim to the invention.

**PRODUCT STAGE**

**Potential Barriers Between Prototype and Product Stages**
A university invention may meet a number of barriers on its path towards commercialization.

1. If researchers fail to communicate with the appropriate office at their university, the TTO may be unaware of a new federally funded grant being awarded to its university. The TTO, therefore, may be unaware of its duties and responsibilities under the new grant.

2. Unknowing or uninformed researchers may not make timely disclosures to the TTO, thus the TTO will not preliminarily search patent-related artwork. Thus the TTO may or may not proceed with intellectual property protection (patent) for the invention. Consequently, an inventor may not be the first to file for a patent on his or her invention. This may delay licensing or may result in failure to license the invention at all.

3. Inventors under pressure to publish research results, may, through their publications, publicly disclose their work, inadvertently activating a one-year time bar for filing patent application for the invention. For example, a researcher publicly disclosed his work on a thermostat with voice feedback. Unfortunately the researcher never filed for a patent on his work in the year following its public disclosure. Because his work had entered the public domain, no thermostat company could exclusively own the intellectual property rights to the concept. Thus, no company would invest in bringing the concept to fruition in the marketplace.

4. When universities retain claims to inventions, the institutions may include them among inventions that it passively solicits potential licensees for. In this case, the invention would not be shopped actively and may never be licensed.

5. Assuming the TTO finds a potential licensing company, the TTO may be unaware of the lower royalty rates (ranging from 3% to 8% for non-software items) associated with AT products (due to much lower sales volume) and may ask for too high of a return. This can mean the invention won’t be licensed.
6. In some cases, inventors’ main goal is to publish their work, not bring an invention to the marketplace. Due to the inventor’s lack of interest and assistance, companies may forego licensing the invention.

7. The inventor may provide inadequate information to the TTO, thus hindering the intellectual property protection and licensing of the invention.

8. The eventual licensing of a prototype can be stalled by a university TTO’s reluctance, skepticism, and complacency in signing off on agreements, including a non-disclosure agreement.

9. An inventor may not actually have proof-of-concept for the prototype of his invention. In this case, licensing the invention will be most difficult.

10. If a university researcher proceeds without significant consumer input, the invention can be void of design functions and features that would enable its licensing and success in the marketplace.

11. In licensing negotiations, the inventor may delay sending the functioning prototype to the licensing company for evaluation. This delay may kill a potential licensing deal as companies cannot wait indefinitely this information. Companies interested in new product development may search for other opportunities. In the meantime, the invention may be rendered obsolete.

12. If an inventor’s prototype does not function the way that potential licensing companies were led to believe by the TTO, it can negate a licensing company’s interest.

13. In the eyes of consumers and licensing companies, a prototype may seem unfinished, thus negating the potential licensing to a company. This applies to companies that may lack the financial wherewithal to redesign a prototype into a product.

14. When inventors send prototypes to potential licensing companies, they may need to answer technical questions. Delays or non-responsiveness on the part of inventors may stifle licensing opportunities.

15. The TTO may fail to identify the correct corporate personnel to contact for licensing an invention, a possibility given that, in AT companies, that role may be filled by multiple people, though it’s unclear who the true decision-maker is.

16. Due to triaging, both internal and external, of new inventions, corporate personnel may not respond to a university TTO’s licensing inquiries.

17. Due to turnover of corporate personnel at a potential licensing company, the TTO representative may have to forge new working relationships with new personnel, or seek a different licensing partner.

18. Delays in agreements on terms between inventors and licensees can mean that timely inventions miss their windows of opportunity. During the delay, the licensing company may decide to focus on a different invention or technology.

19. Incorrect licensing terminology (e.g., the inaccurate use of ‘Universal Design’ [UD] instead of ‘Transgenerational Design’ [TD]) may inadvertently disinterest a company.

20. In presenting to potential licensing companies, TTOs may fail to provide enough information or may incorrectly format the information.

Carriers that Nullify Barriers Between Prototype and Product Events
The following are carriers and standard practices that can nullify the potential barriers noted above. With the receipt of a new federal grant, a university’s TTO office needs to be brought up to date as soon as the initial granting agency’s site visit and prior to the actual financial award. The funded researcher and funding agency are responsible for ensuring that university TTO is aware of its commercialization duties and associated responsibilities under the new federal grant. Time should be spent outlining both the researcher’s development projects and the nature of the associated responsibilities a university’s TTO should anticipate in terms of representing and licensing any resultant invention.

Prior to the official award of the grant from the federal agency, negotiations with the university’s TTO office should include how, and under what terms, resultant IP will be licensed by the university. Because the university’s research is federally funded, there is an expectation that resultant IP will make its way to the commercial marketplace for the benefit of taxpayers who have funded that research. General guidelines for royalty rates and licensing expectations should be covered.

Researchers and or inventors should understand that the grant award has key deliverables that need to be accomplished. The granting agency should make the researcher aware that his or her deliverables for the grant are not finished when they have completed their publications and prototype. It remains incumbent upon researchers to assist in licensing any resultant IP from their research, which means being available for consultation, providing adequate information to their TTO, and continuing to work on the prototype so that it is presented in the best light to potential licensing companies.

Researchers should interject consumer input early in the design process and when finalizing the pre-production prototype. Even large manufacturers of mainstream consumer products make product design decisions without factoring in the needs, wants and expectations of the full range of end consumers. This process leads to ineffective products in the marketplace, new product failures and product abandonment. Failure rates for new product introductions vary by industry, but they generally range from 30% to 90%. Many of these failures can be traced to a point early in the product design process where significant consumer or device-user information was not collected and or not analyzed.

The AT industry has faced the same complaints for decades. The medical model of rehabilitation service provision readily substituted clinical requirements for user requirements. Failing to involve consumers with disabilities in every aspect of product design and development results in products that fail to meet consumer expectations and fail to deliver the required functional capabilities.

There is also a significant need to identify a Corporate Partner. This is best accomplished prior to the submission of the proposal. Ways to identify and screen potential corporate partners are discussed below. Several points on the checklist, that if not addressed, pose potential problems down range for the grantee/corporate
collaboration. The following excerpts from a paper titled: “Corporate/University Collaborations in Product Development” (PDMA Annual Research Forum, Orlando, FL, October 2012) presents obstacles a researcher/may face and a methodology to address those obstacles.

BACKGROUND
Over the past few years, corporations are more frequently seeking research and development partnerships with Universities. In some cases, the tough economy has forced corporations to seek other, much less expensive, avenues for research and development. In other cases, the corporation may be seeking University partners that possess unique research capabilities or facilities. However, the differences between the way research is conducted at Universities and the needs of the corporation have prevented potentially successful collaborations.

At Universities, research is routinely performed, and the outcome of that research is of importance to both the researcher and their institution. Primarily, research findings and publications lead to tenure and prestige for the researcher and the university. Secondarily, research findings may lead to new technology breakthroughs, and of course, to patents and licenses which will bring further revenues (royalties) to the University. In contrast, how the research will impact the financial bottom line is the sole concern of the corporation. The research must either lead to the development of new, profitable products in the marketplace, or it must impact production processes and provide a significant competitive advantage to the corporation. Most University-based researchers have little knowledge and understanding of market demands in a corporation’s industry, and they lack the expertise needed to create products that work in the marketplace. Conversely, most corporations have little insight into the existing academic bureaucracy at many universities. Due to this slight conflict, University and Corporate collaborations on joint product development projects have always had a number of obstacles on the way to a successful joint project.

**Obstacle 1: Confidentiality Agreements**
For each collaborative project, a confidentiality agreement must be negotiated and signed by all parties involved (researcher, the researcher’s parent institution, and the corporation). These agreements can have a negative impact on the researcher’s need to publish.

**Obstacle 2: Agreement on the scope of research**
Allocation and availability of the academic researcher’s time along with allocation and availability of the corporate entity’s staff time have to be outlined and defined. In addition, this agreement must set fixed research and development timelines. Academic researchers typically operate in terms of semesters or years, and they historically have not been held to time-sensitive research deadlines. In contrast, corporations typically have short product development cycles with specific deadlines for product introductions (for example, at tradeshows like the Consumer Electronics Show [CES]). Therefore, both the University and its corporate partner have to be aware of and understand each other’s scheduling constraints.
**Obstacle 3: Ownership of Intellectual Property**

Prior to the start of research, ownership of the Intellectual Property (IP) resulting from the collaboration must be defined to avoid wasting the time and resources of both the university and the corporation. Without an agreement in place prior to starting research, conflicts regarding ownership may arise after the completion of research. In such cases, the research may ultimately never be used to create a new product. The inability to overcome the aforementioned obstacles combined with other issues has led many U.S. corporations to seek collaborations with foreign universities to fund research and development. These collaborations are following a path similar to the exodus of U.S. manufacturing to lower cost, less regulated overseas manufacturing sites [3].

**METHODOLOGY**

*The model / process presented in this paper is predicated on the premise that the researcher and his or her home institution are seeking to initiate collaboration with a corporate partner.*

Best practices start with finding a corporate match for a joint product development project.

**Steps Prior to Completing a Formal Research Agreement**

**Step 1:** Researcher must identify a topic area to be addressed by the collaborative effort. It could be an unmet need in the marketplace or it could be the scientific area that the researcher is currently working in (applied research versus basic research).

**Step 2:** Identify companies working in that industry or technology area. Investigate whether or not the corporation has previously entered into external partnerships or funded R&D work by an outside entity to develop a new product. Ascertain if they are open to receiving and evaluating technology or inventions from outside of the corporation. If the company is open to outside submissions, identify the appropriate point for contacting the corporation (i.e. the Vice President of Research and Development or the person responsible for new product development).

**Step 3:** Prior to contacting any potential corporate collaborator, the researcher and university must have a template in place for all legal agreements needed. Corporations are on tight product development schedules and do not have the flexibility to spend months negotiating agreements. If the university does not have a corporate collaboration model in place with the appropriate agreements, the company will go elsewhere or decline to participate. Template agreements that the university should have in place are:

1) **Confidentiality Agreement** (also known as a Non-Disclosure Agreement or NDA) Not only do you need to have your University’s NDA available, you also need to have someone from the University’s Technology Transfer Office (TTO) assigned to your project as well. In many cases, the corporation may not be able to sign the university’s NDA template since the needs of corporate partners are all different. Therefore, in the event that the NDA needs to be modified, or the corporation sends their own NDA to be
signed instead, the TTO assignee must have the authority to quickly negotiate an NDA that is acceptable to all parties.

2) Scope of Research Agreement
A tentative framework for the scope of research and development efforts should be drafted that includes the personnel resources to be used from both the university and the corporation, what university lab or research facilities will be used and during what time frame, timelines for completion of research, deliverables from both the university and the corporation, and how ownership of Intellectual property (IP) will be defined. If the corporation owns all outcomes from the research, the university must negotiate how it will be compensated for its time and resources. If the university and/or the researcher have needs for publication, these must be negotiated and defined. This template agreement will need to be the most flexible since it will need to be negotiated with the corporate partner.

3) License or Purchase Agreement (provided the research is successfully completed)
If the IP is jointly owned or ownership remains with the university, terms for the eventual license or sale of the protectable research or invention must be established. This would likely include terms such as:
• Exclusivity – does the corporation have the exclusive right to license or purchase the IP from the University?
• Term – how long will the corporation have the rights to use the IP?
• Fees or royalties – how will the university be compensated for use of its share of the IP?

Although the mission of the university is to benefit society, the mission of corporation is to provide a financial benefit to owners or shareholders. To comply with disclosure rules to guarantee IP protection and to help the corporation obtain a market advantage by being first to the marketplace with a product, researchers may have to refrain from publishing their research for a longer period of time than usual in order to make the collaboration work. Having discussions with your University’s Technology Transfer Office (TTO) in advance of any collaboration is extremely important. Not only will the TTO produce the needed template agreements, but the TTO will help guide you through the collaboration process to ensure you are legally protecting the IP generated by your research. Engaging the TTO early will streamline the negotiations with a potential corporate research and development partner.

Technology Transfer Plans Quick Reference Guide
For RERC grantees authoring and presenting their mandated TT plans in their first year of existence, we offer the following questions that should be addressed in your plan and in your presentation:

• What unmet need is the product/tool/instrument/standard/freeware trying to fulfill?
• What is the scope of the project?
Defining it will hopefully prevent scope creep.

- Who is your target market? Be specific.
  - Who? If appropriate include age, gender, disability or functional limitation.
  - Where – location nursing homes, hospitals, general usage.
  - How many? Numbers defining how large the market is for the product.

- Have you done a competing technology search?

- What external evaluation have you done? Involve end users? Focus Groups, surveys? Participatory development?

- Is it an Orphan or Mainstream product?

- What is your Path to Market? Do you have a corporate partner? Will you or your team be in charge of TT and commercialization? Do you plan to license your product?

- Have you projected what, if any, IP will result from your project? What is your IP strategy? Have you worked with your University’s Technology Transfer Office (TTO)? Have you created and used a confidentiality agreement?

**Technology Transfer Plans Quick Presentation Guide**

For those grantees having to prepare an oral presentation of their TT plans to their funding sponsor we offer the following as to what the presentation should include:

- What is the development project?
- Who is heading up the project?
- What void is the product/device/instrument/tool/standard/guideline filling? Why is it needed?
- Do you have a timeline (milestones) for the project and percentage FTE of personnel performing the work?
- What will the end result of the project will be?
- Plan for direct consumer or stakeholder (ex. if clinician is your target market) involvement in your work.
- Any corporate partners on board as of yet?
- Who will be spearheading your commercialization efforts and when? (If applicable) Example, UM Technology Transfer Office
- How will your efforts benefit the target market? And in the end, people with disabilities?