ANNALS of Faculty Engineering Hunedoara
International Journal of Engineering
ISSN: 1584 - 2665

MARKET DRIVEN INVENTIONS IN SMES – A MODEL FOR GROWING ECONOMIES BY CONNECTING ENTREPRENEURIAL INVENTORS WITH LOCAL COMPANIES

Petar VRGOVIC[1], Brian GLASSMAN[2], Abram WALTON[3], Predrag VIDICKI[4], Nikola SUZIC[5]

[1, 4, 5] Faculty of Technical Sciences, Novi Sad, SERBIA
[2] Innovation Management Purdue University, Miami Florida, USA
[3] Innovation Management Purdue University, Anderson, IN, USA

ABSTRACT
Innovation as the driver of regional and global economy requires a constant striving for new inventions. The following article presents a model and communication process for growing local and national economies by connecting market, entrepreneurial inventors and medium size enterprises (SME). The goal of this model is to create incremental or disruptive product and service concepts for small and medium size enterprises that often cannot setup, dedicate resources to, or afford their own R&D processes. Our model, titled the Joint Invention Market Model (JIM Model), is detailed herein along with its potential limitations. This model is believed to help SMEs of developing nations, and in particular provide SMEs with new product concepts at a lower cost, more quickly, and of higher quality than if SMEs created those concepts themselves.
Keywords: Entrepreneurship, Inventing, Idea Generation, Fuzzy front end, Communication

1. INTRODUCTION

Developing countries around the world are diligently examining the means of growing their local and national economies. From their efforts topics like macro economics, regional entrepreneurship, regional venture capitalism, small business incubation, and innovation have emerged as areas which can be tapped to provide the desired growth [1]. Of these, innovation stands to be the least explored, which is partially due to the newest of this field [2]. National innovation initiatives hold many opportunities to advance and grow a nation: China achieved this via their local innovation ecosystem built for advanced products (AKA an innovation hub) in cities like Zhangjiang [3], Korea established innovation hubs for research and development of semi-conductors, microchips, and advanced electronics [4], Israel built innovation hub focused around the telecommunication industry [5], and the USA's Silicon Valley is an example of a software innovation hub [6]. These efforts towards advancing innovation at a national scale have proven to be very fruitful, and were performed with a combination of macro-economic policy, venture capitalism, innovation management, and regional entrepreneurship initiatives.

One major insight we gleaned from the innovation hubs is the existence of a support network of independent inventors and product consultants [3,4,5,6]. We hypothesize that independent inventors can help grow local and national economies. In particular, by applying this concept to small to medium size businesses we believe we can have the largest impact on local and national growth. Small and medium enterprises (with fewer than 200 employees) are targeted because they make up 99 percent of industry and account for more than 70 percent of employment in European Union [7].

Small to medium size enterprises (SME) are very different from large business in that most of them lack a formal process for developing new products and services [7]. This is partially due to having limited resources (i.e. capital and people) to dedicate to such a process, which creates a vicious circle blocking most of small businesses from growing.

We hypothesize that small to medium size enterprises require several factors to make the transition into a large business; improvement in marketing, sales, operations, decision making, and so on... Of these we are concentrating on the strong need for a formal product development process. Creating this process requires, among the rest, individuals to aid in product development (i.e. the support network mentioned previously). One of the largest problems in product development relates to the fuzzy front-end of innovation [8,9,10,11] in particular, how to generate new product ideas [12]. Interestingly, both large and small businesses struggle with this problem [13], however large businesses have more money and people to aid in generating ideas, but yet it is still a highly inefficient

process [13]. We hypothesize that if we can enable small to medium size business to be more effective at generating ideas, they will be increasingly motivated to develop such ideas into products and services. As a consequence we believe this will help grow SMEs, and allow them to better service their customers. Hence, this paper focuses on creating a model that can help small to medium size businesses gather, find, and create great new product and service ideas efficiently.

2. LITERATURE REVIEW AND INITIAL PROBLEMS

Unfortunately, very little research has been conducted on the idea needs of SMEs. Barclay, Porter, discussed creating SME clusters to promote innovation approaches to business growth, and found many downside of setting up such a cluster [14]. Del Castillo & Barroeta discussed promoting innovation in SME via policy, economics, and local initiatives [15]. We believe there are many challenges facing small to medium size businesses when it comes to inventing or generating new product and service ideas and they revolve around: 1) limited resources, 2) lack of inventive people, and the 3) lack of understanding about the idea generation process [16].

Firstly, because of SMEs' limited cash and resources, in most cases they cannot afford to create product development departments, or fully dedicate people to the creation of new products and services [17,18]. Further, because of their limited resources, SMEs have limited ability to conduct the customer research that is so vital to the generation of ideas [17,18]. Hence, SMEs need a lower-cost way to generate ideas.

Secondly, not everyone is creative, and we assert that very few people a truly creative genius [19]. Some researchers may argue that creativity can be taught [20], but retrospectively analyzing highly cited patents submitted in the USA will show a high percentage of inventors submitting multiple patents [20]. Lastly, training people to use idea generation methods and processes is time consuming and laborious [13], and hence doing so is not very feasible for the large number of SME in each country.

Independent inventors have many problems inventing on their own. Limited ability to promote their invention services implies that inventors are usually not good at promotions and often have limited reach with their promotional efforts. Next, inventors often wary when inventing for organizations because they are not sure if the company will steal their ideas without paying for them, and because of their limited resources they will have no ability to sue the infringer, so the legal concerns and lack of incentives to invent for others is also a major issue. Limited resources for the research and prototype development is another problem that proposed model addresses.

3. EXPLANATION OF MODEL

3.1 Grounding for the Model

Before explaining the model, one must understand that we have selected an "invention pull model", not an "invention push model", because of a fundamental belief that well informed inventing creates products/inventions that are much more in-line with customer's needs, and are thus ones that will be more successful in the marketplace. To this end, some companies often hire employees outside of their industry because they are not tainted by accepted industry practices [21]. However, because these inventors lack a detailed understanding of their customers' needs, they 'too often' go off inventing products for small needs, or non-existence needs, or create products that are not compatible with the realities of their customer's situation/environment. The "invention pull" model on the other hand uses a detailed understanding of the customers' needs, wants, problems, and situations, then deduces the largest value needs/problem for which product solutions should be invented. This greatly increases the chances of product success because, in essence, the opportunity area has been predefined.

3.2 Limitations

There are some limitations that should be addressed by those who would implement this model. First, our model depends highly on the organization's ability to communicate with its' customers. If the company does not have a clear channel for communication, the product concepts will not be able to be verified. Second, the outcomes of our model are only as good as the initial "problem requirements" provided to the inventors. This means, if the customers are not being honest, or are not providing enough details on their problems/needs/situation the produced product/inventions will be a poor match to their needs. Third, customers should be able to articulate characteristics of their desired products or services, rather than solutions. Ulwick [22] states that the traditional approach of asking customers for ideas tends to undermine the innovation process, because most customers have a very limited frame of reference and cannot imagine beyond the already used product. Furthermore, their functional fixedness (tendency to fixate on the way something is already used) makes them offer

incremental ideas rather than radical ones [23]. Fourth, this model requires market research and customer research to be conducted properly. Not having access to this vital information means that a fully informed understanding cannot be created for the inventors. Furthermore, this model requires the party employing it to be familiar with marketing research and customer research. Poorly conducting these activities could create faulty customer needs and problems, and thus poorly created inventions.

3.3 The Relevancy and Limitations of Market Data and Customer Input

Marketing information and customer data (i.e, customer needs/problems/situations) are vital in these new product development projects. Much research exists suggesting that inventing/developing products based on customer needs has higher product success rates, and is less risky than inventing based on technology advancement [24,25]. Because SMEs have limited resources and time, using less risky invention methods is preferable; again, this is a reason why we selected the "invention pull" model.

One of the main limitations of the "invention pull" model is highlighted by Clayton Christenson's book Innovator's Dilemma [26]. Here he states that companies that intently listen to their customers produce incremental products, while those companies that are less attuned to customer demands have higher chances of producing disruptive products.

Additionally, most customers, except "lead users", are looking for pragmatic and incremental solutions to their everyday needs, and it is very difficult for them to see or even imagine a disruptive product solution. For example, many tollbooths around the world now have electronic toll devices that allow you to drive through at full speed. If you asked customer how to make tolls better before this technology was released, 99% of them would have said to build more cash toll booths [27,28,29,30]. Hence, customers on average suggest incremental solution, thus they should not be trusted with creating solutions [22]. They should only be used as sources of problems/needs. Consequently, the act of creating solutions should be entrusted to highly creative individuals, like inventors, who are aware of a multitude of solutions, like electronic transponders for toll collections.

4. PROPOSED "JIM" MODEL

Our model, titled the Joint Invention Market Model (JIM Model) integrates small to medium size enterprises, their customers, inventors, and market research firms together. The goal of the JIM Model's is to create new products/service concepts that have a high chance of market success, and to create them at a low cost to the SMEs.

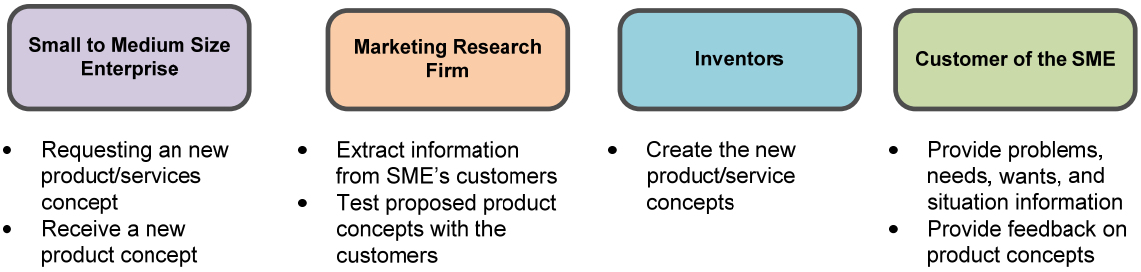

Figure 1. General outline of the parties involved in the JIM Model

The model is best understood by reviewing the detailed process model shown in figure 2. The process starts by a SME submitting a request to the JIM model operators, who are probably delegated by a government body or an independent agency assigned to this action. These operators should rather be placed by the government than from a private company, because government presence should be strong when stimulating innovation in developing countries, having only global interest in development processes.

This request details the following: A) the type of product desired (specific product/service category); B) the customers groups for whom it will be created; C) the expected result (incremental or radical); and D) the time frame and resources available. Note the JIM operators may be a government run agency or a privately held company.

Step two requires the marketing research firm to structure the market/customer research studies. Here the sampling methods are selected, and the customer groups to be interviewed or survey are carefully selected.

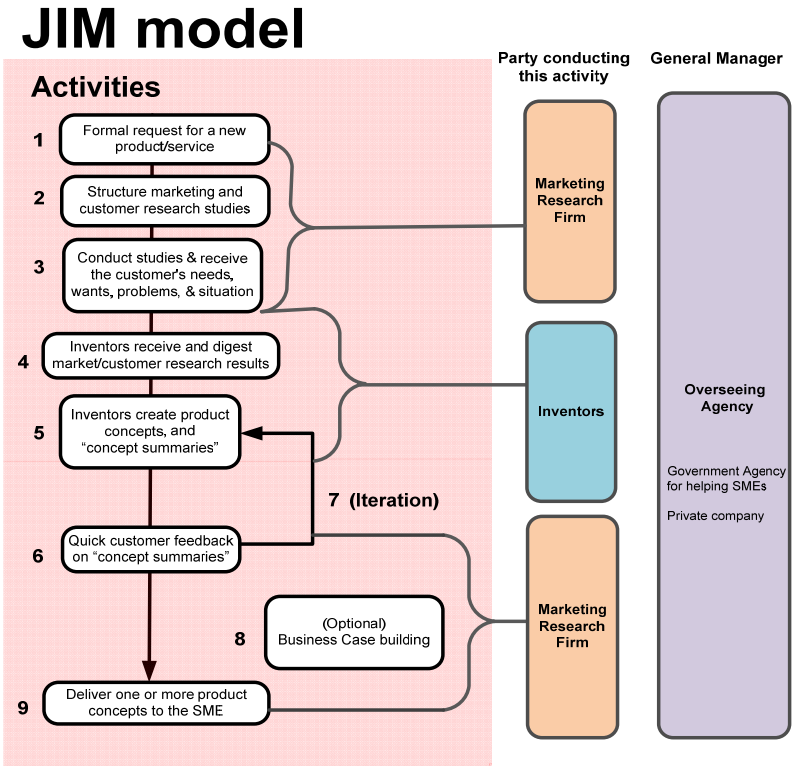

Figure 2. The JIM Model and its Process Steps

The third step is crucial, in that the customers' situation and their needs, wants, and problems are captured via interviewers and survey instruments. Again, customers must be asked for needs and problems, not solutions. A question should sound like "what problems are you having with your product," not "how could your product solve your problems?". Trained interviewers are needed for this step; which also includes codification of the data. Significant loss of information should be avoided.

The fourth step involves the pool of inventors. Here the inventors receive a summary document of the product-opportunity for which a new invention could be created, and the general information on the customer's situation, problems, and needs. Inventors can be located anywhere geographically because the summary document can be emailed to them. Again, many SMEs do not have R&D departments or teams, hence having access to a large pool of inventors at a low cost is of great benefit to them. Interestingly, several websites currently post invention challenges for their large inventor pools (http://www.Innoget.com, http://www.refresheverything.com, http://www.ideaconnection.com), but these websites fail to deliver the detailed market and customer information generated in steps one, two, and three.

The fifth step is the conception of the product or the service. Again, the benefit of having a pool of inventors is that a diversity of product concepts will be generated quickly. The inventors then create a concept summary that describes or shows the core benefits of the product, but not in too much detail. The goal of the "concept summary" is to quickly communicate the product concept to the recipient SME. Illustrations, 3D models, and prototypes should only be used if the concept is too difficult to describe in words, or does not capture the benefits of the product concept. Producing the "concept summary" is tricky, so the assistance of the JIM Model operators may be needed to ensure concept-summaries are correct and communicated adequately.

For the sixth step, the current and potential customers of the SME are used to test the concepts. These customers review the concept, and provide their feedback. This should include: A) the extent to which the product solves their problems, and B) how it compares to other products on the market. Even the inventors can perform this step because their interactions with the customer can spawn better ideas.

For the seventh step, the inventors consider feedback from the customers and new and improved concepts are built, along with the accompanying "concept summaries." This is iterative, so this back and forth with the customers may take place two or three times; however, if the first-round concepts are very well received by the customers the SME may move on to the next step.

Step eight is optional, and choosing to perform it depends on the product concepts being proposed. If the concepts require a large development effort (i.e. considerable development time, money, and dedicated employees) then the SME should spend the extra effort needed to build a business case. By building a business case, the SME is forced to think through the different aspects of the concept to ensure it will create a fair return in revenues and profit. This requires understanding the feasibility and risks associated with manufacturing, marketing, sales and service [27]. As well, the costs, expected sales, returns, and profit should be determined. With the risks and rewards understood, a SME may choose to embark on a costly product development project. Further, by creating a business case SME are also problem solving and removing risks from the product and its development. This is a vital activity in the front end of innovation.

The ninth and final step is delivering the product concept(s) to the SME for which they were created. This can be done via a formal presentation, where one or more concepts are presented to the recipient SME.

4.1.Example of the JIM Process in Use

The following fictitious examples showed Alpha Corporation a medium sized business with 200 employees in Serbia who requested a new disruptive product for their mining equipment product line. In particular, they wanted a new type of drill unit, and initially said they wanted it to drill faster. The newly created government agency in Serbia called 'SME Inventors Help Service' received this request along with a 900,000 Serbian Dinar ($6,700 US).

The SME Inventors Help Service contracted a market research firm which interviewed several miners and mine directors. From this SME help service learnt that ability to keep the drill stable while drilling is vital, and noise reduction a major second factor. With the problems and needs identified, SME Inventors Help Service presented these problems to a group of 40 inventors. The inventors then independently generated concepts for new drills and produce invention summaries. Out of this the top 10 inventions were selected by the government agency, and those selected inventors are monetarily compensated for their efforts. Next, the inventors group brainstormed to refine the concepts, and presented the top 5 concepts to the government agency. Because drills are expensive to make, the government agency contracted an independent firm to create a business case for each of the five concepts. Finally, the government agency presented the concepts to the Alpha Corporation who was delighted. The whole process took 2 months, at a fraction of the cost of having one full time R&D employee, and created 4 disruptive products. The firm then developed one of these products, and sold it to the Serbian and Russian mines and generated a significant profit from the new product line. Further, this increases the GDP of Serbia and thus benefited the Serbian government. Therefore, even the Serbian Government's ROI was positive for having invested in SME innovation.

4.2. Weakness of the Model and a Solution

Trust is a constant concern for any inventors. If the inventors trust an organization not to steal their inventions, then great products can be created. However, because trust is often not fully established, failed relationships often result. By having a unbiased intermediary, (like a government agency, whose only gain will come from the growth of the economy) in-between the inventors and the SME, issues of trust are resolved faster. Further, this government agency will work with inventors to insure trust is developed. Paying quickly for valuable ideas, praising efforts, and communicating clearly on all tasks will help develop this trust with inventors. Further, this government agency needs to develop a reputation as a trusted and useful source of ideas for SME's. Part of soliciting an idea requires the SME to pay for the ideas they are requesting. This is a business decision, and to justify their usefulness SME's must see proof of government agencies effectiveness, via the past ideas and the profits that were generated for other SME's.

5. CONCLUSION

The presented model is applicable for small and medium enterprises, and should be interesting to them because it simplifies many actions necessary for good organizational R&D strategies. It should also attract attention of a developing contry's government as it helps local economy growth in very efficient way, combinating skills from different subjects. To success, government must inniciate the process and constantly monitor it, bridging the gap between SMEs and independent inventors, focusing them both on market needs.

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