REVIEW ARTICLE

PARTENEERING ENTREPRENEURSHIP AND INFORMATION TECHNOLOGY (IT) FOR A BETTER WORLD

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ARTICLE INFO	ABSTRACT
	This paper titled "Partnering of Entrepreneurship and Information Technology (IT) for a better world" , considers the possible inherent entrepreneurial nature of IT; how to foster IT innovation; and examination of the inherent difficulties currently found within the IT of Nigerian Universities in regards to supporting the development of innovative and creative ideas. Case study and survey were used as methodology for the research. Close to 200 students participated in the survey with each student answering ten multiple choice questions. Statistical analysis was performed on the results to discover any potential trends emerging relating to the impact of entrepreneurship on the IT industry and the current IT tertiary curriculum. The purpose of the student survey was to determine the current perspectives of students studying at tertiary institutions regarding the role and impact entrepreneurship, creativity and innovation has on IT. The results of the research, included herein, have provided a number of unique contributions to the field in addition to a set of successful industry perspectives on IT Entrepreneurship. In particular how to manage and increase the opportunities for an entrepreneur to continue economic growth in the IT sector in Nigeria.

INTRODUCTION

The art of entrepreneurship has the potential to ignite creativity and innovation within the IT industry. With the advent of the internet, increasing popularity of broad band and the introduction of Web 2.0 applications; the information age has becomeban opportunistic environment for entrepreneurs. The rapid evolution of technology in the last fifty years plays a significant role in our day to day lives. Information Technology (IT) builds and supports the processes of organizations on a competitive global platform. The shift from the physical world to the virtual world is also a noticeable trend as an increasing number of everyday functions and processes are shifting to an electronic realm. Traditionally, IT entrepreneurship has been most successful and lucrative in the United States (US). Areas of Asia and Europe – particularly Scandinavia – have exhibited entrepreneurial flair but not to the quality and frequency of the US. There are a few theories proposed as to why this may be the case; including the likes of resources, exposure to venture capitalists, working environments, education standards, market size, risk taking experience and business strategies. Despite the suggestions of inadequacies there is no conclusive evidence as to why successful entrepreneurship cannot happen anywhere else in the world, such as underdeveloped country like Nigeria.

The idea of combining the traditional business skills and traits of entrepreneurship within information technology innovation practice is a relatively new concept. There are no clear methodologies or templates that aim to foster the process of creativity, innovation and entrepreneurship in the development of IT. Therefore, the focus of this paper is to detail an intensive ongoing study, to date, that is investigating technology-based entrepreneurship with a focus on the issues found with IT innovation in Nigeria. The three major research questions addressed by the study, are the following:

1. *What constitutes successful IT entrepreneurship?*
2. *What sparks innovation in IT?*
3. *Is it possible to improve the frequency and consistency of IT entrepreneurship in a positive manner?*

The remainder of the paper is used to detail the work and results of the research. Best efforts have been made to encompass a vast body of results and research in this paper. Therefore, brief background and related works are detailed in section 2, sections 3 through 6 discuss the components of the study, while other sections provide the research results and

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conjectures on what can be done to foster IT entrepreneurship in Nigeria to help economic growth.

BACKGROUND AND RELATED WORK

The ICT evolution is heavily linked with the core concepts of creativity which enables new technologies to emerge. Gupta (1998) introduced the idea of creative knowledge networks that have the capacity to "unfold tremendous creative energy of our society by helping people dream and converting these dreams into reality by networking with other individuals and institutions." Likewise, the importance of collaboration, for our focus digital or virtual collaboration, is identified as being a valued commodity for successful innovation (Streitz et.al 1999). The authors examined the i-Land environment which is an interactive landscape for creativity and innovation. The literature identifies the i-Land application environment and educational setting as a prime example of IT creativity and the fostering of creativity to support IT development.

Essentially, the i-Land innovation has shown that creativity is an important part of IT development and that the evolution and implementation of IT also has an equally significant impact on the creative aspects of information organization and in producing new innovative processes and ideas. Mckelvey(2001) described Internet entrepreneurship as a concept that uses a global network in order to capture the potentially worldwide distributed nature of innovation processes involving knowledge-intensive products in the modern economy. The phenomenon involves social and economic components and not just technology as IT, computers and the Internet. Furthermore, it stated that the definition of "Internet entrepreneurship" has five main attributes:

1. That multiple persons are distributed organizationally and/or geographically but can still interact in real time to create novelty;
2. That one person can be both user and developer but she/he does not necessarily combine both roles;
3. That copying and distributing information may be costless or may be costly, depending on the situation;
4. That distributed persons contribute to innovation through the investment of their resources (time and effort – without necessarily being 'paid' for their labor);
5. The instantaneous worldwide distribution of software and communication over the internet, or World Wide Web enables an identifiably different process of knowledge creation from organization-based innovation.

Internet entrepreneurship exists as a modern phenomenon that functions as a new means of innovating and has shown to have a positive impact on the economy as it has led to a system of improvements with regard to the evolution of IT. Open source software (OSS) has had an impact on traditional R&D processes and strategies of firms and must be understood as an early stage of innovation with strong converges toward commercialization (Mckelvey 2001). See (2004) identified that those who combine skills and creativity in Internet site creation, business know-how, access to finance and knowledge are successful IT and Internet entrepreneurs and that the

frequency of this act is still relatively rare worldwide. There is overwhelming support that the era of the entrepreneur is coming of age and Ma and Wang (2006) revealed that entrepreneurial opportunities in IT are becoming more and more prominent as technology evolves. The technological challenges of today's evolving IT/business environment can be pre-determined by conditions that shape social change; also It has been proposed that technology and organization coevolved, and that this process is characterized by periods of social construction and periods of technological determinism.(Groenewegen and Taminiau, 2003). Empowering people and corporations to develop entrepreneurship has greater success when supported by correctly using together computing resources and existing knowledge. Further, access to architectural tools for business and business knowledge and understanding of the opportunities arising out of new IT are two essential conditions for entrepreneurship development. (See, 2004) According to Preston (2001), students studying at the Massachusetts Institution of Technology (MIT) create roughly two new inventions every day. "MIT's Technology Licensing Office files four patents a week, licenses hundreds of inventions to industry each year, and creates ten to twenty new start-ups a year around these inventions" (Preston: 2001). Chen (2007) suggests that the advent of the Internet has been a positive but "disruptive force" to the world's economies. For example, the arrival of wireless communications has revolutionized the telecommunications industry with access and adoption rates growing exponentially. In reference to the last 50 years of technological advancement, IT innovation goes hand in hand with the rate of its evolution. The Internet has redefined the boundaries of technological advancement and innovation and with it created levels of uncertainty that provide opportunities for natural innovators in every market of every industry.

Innovation in the IT industry is evolving and formal ways of fostering technological advancement at all levels of operations are still in its early stages. Preston suggested that success in innovation should be rewarded as positive reinforcement fosters future innovations and suppresses the stigma of failure. This is the major difference between successful innovation in the US and any other part of the world. Gupta proposed the idea of knowledge networks in a bid to "connect grassroots innovators" which aims to help generate a "market for ideas which may network innovators, investors and entrepreneurs". Gupta [1] goes on to suggest that through the use of modern IT devices such as "real time connectivity through data bases and multimedia technology across language and cultural boundaries may increase societal capacity to spur, spawn, stimulate and sustain grassroots innovations". On the other hand, Bernstein, Klein & Malone (1999) put forward that "online repository of knowledge" and the use of IT to achieve this can greatly improve the effects of innovations and increase its frequency for future innovative endeavors.

Reporting ten prominent ict innovations as evidence for partnering

A major component of the research involved the investigation and analysis of ten influential and widely recognized innovations of the IT industry. Each concept, product or venture was profiled by describing how the idea came about,

what made the idea unique and how the innovation became so successful. The review incorporates the definition and use of a success metric which aims to classify the origins of IT innovation. The review contributed to knowledge on IT entrepreneurship and particular trends that contribute to successful IT innovation and creative idea generation. The objective of the investigation was an attempt to answer some of the following questions: What is a successful IT innovation?; How did the creators first come up with the idea?; and How did they then market and transform that idea into reality? The following ten ICT 'products' were chosen for analysis: MySpace , YouTube , eBay , PayPal , Skype , Hotmail , Second Life , Apple, Expedia and Facebook . All of these ICT products have a prominent and successful standing being used by millions of entities every day. For many, these innovations make life easier, contribute to economic growth, provide entertainment and connect a globally diverse user entity base. Each of the products in their own right has delivered something unique in addition to representing successful examples of creativity, innovation and entrepreneurship in the IT sector.

This study aimed to examine common success traits of IT innovation by studying what the product is, how it is unique and how it became successful. In addition, to provide important knowledge to the analysis the creators or founders of each product was also investigated. This included their background, experience and other personal characteristics. Skinner (2008) developed a number of categories to use in a classification scheme and formulate a metric of success. His analysis showed that the majority of IT innovations and entrepreneurial internet ventures are started either through the natural evolution of technology, the intrinsic or extrinsic motivation of the creator, or a form of cloning innovation, where by a previous idea was improved upon. Therefore, the first category in his classification scheme involved grouping an innovation into one of three CREATION categories:

• **Innovation** – the product or idea was built upon another idea that was similar or improvements were made as an extension to an original concept. The product is still unique and different but may serve the same purpose as the copied idea.

• **Evolution** – an idea or product that is an act of innovation where the idea came about and evolved via the natural advancement in technology. Opportunities and new ideas are made possible through the advent of new technology.

• **Motivation** – a drive that comes from within the entrepreneur themselves. It can be evident in different forms such as the opportunity of personal financial gain, or the fulfillment of a personal need in which one recognizes as an opportunity in the market.

The next category was the CREATOR category and contains sub-categories relating to demographical and personal information of each product creator or creators. The sub-categories for classification are the following:

• **Sex** – the sex of the creator(s). This is an important demographic due to the fact that the IT industry has traditionally been a male dominated industry. Do males still dominate this industry?

• **Age** – the age of the creator(s) when the product was launched and at the time of its success. This is an important characteristic because age can relate directly to experience, potential for creativity and risk taking behavior. Is the age of the entrepreneur a determining factor in the success of an IT innovation?

• **Nationality** – the birth place, cultural background and upbringing of the creator(s). Does one's nationality or where one was raised have an effect on the success of an entrepreneurial IT innovation?

• **Education** – the education of the creator(s) – did they have a tertiary education? How did they learn what they needed to learn in order to be successful? Are qualifications important in attaining success?

• **Development Environment** – where the product was developed. The majority of successful IT innovations have come from the USA, why is this the case? Can products flourish just as well in other parts of the world?

The final category used for classification was what we termed the SUCCESS METRIC. As a product success means different things to different people it is useful to have various classifications for success besides the common net worth, or in some cases the 'sale price'. That is, an IT innovation and their creator(s) are often seen as being successful based solely on how much they sold their idea for. Our classification scheme argues that net worth is not the only metric of success as our classification framework includes the following categories:

• **Sale value or estimated worth** – the annual net revenue of the company/product/idea. If sold tomorrow, what would be the net worth or value of the company/product/idea? This determines the success threshold in terms of currency value.

• **Registered users or quantities of products sold** – the number of registered users or total products sold of the innovation and the time it took to reach that figure – this measures the success of a company/product/idea with regard to popularity, usefulness and competition. At what point did the company/product/idea become successful and how quickly did it get there?

• **Product name and brand association** – Reputation, recognition and the establishment of the company/product/idea as a "generic term" within common society – has the company/product/idea reached a level of success where the brand is now well known and synonymous with superior quality and customer satisfaction? This measures the longevity and sustained success of the company/product/idea with regard to industry standards and customer loyalty.

• **Cloning** – the re-creation of a company/product/idea by a competitor – has the company/product/idea been copied or is it a copy? The copying of an original concept signifies success in terms of a contribution to technological advancement or a pioneering change in the industry.

• **Globalization and localization** – the widespread use and acknowledgement of the company/product/idea within its

chosen industry. The use of global/national domains with local customized content signifies widespread success.

Success and Entrepreneur

Another phase of this study involved the analysis of successful innovator and entrepreneur within the ICT sector. A case study of perhaps the most publicized and recognized technology entrepreneur and innovator, Mark Cuban, is considered.A case study has the benefits of detailing what may or may not have worked in the past and determining whether it is applicable as a benchmark and guidance for those wishing to emulate its success. Mark Cuban currently is a benchmark in ICT innovation with a string of success's both by his amassed personal fortune and the fact many of his most successful innovations either fulfilled one or a number of our success metrics. For example, he sold his first company Mirco Solutions Inc for US $30 million, followed by the sale of Broadcast.com for US $5.7 billion. Further, registered users for Broadcast.com were in their millions and Cuban's latest project, HD Net, is received in 66 million US households. Besides being described as having a natural entrepreneurial nature, Cubans is the epitome of problem-based learning as his philosophy is to say yes to basically any challenge that set before him. The results we draw from this case study also indicate that a formal education in computing is not required for success. Rather, the ability to identify an opportunity and take advantage of it is of more importance. As our study aimed to show, the IT sector continues to provide many such windows of opportunity due to its rapidly evolutionary nature.

Current ICT support and the next generation

The next component of the research was to identify IT strategies and applications that facilitate creativity and innovation in IT entrepreneurship. Firstly, brainstorming is shown to be a fundamental collaboration technique that facilitates the collection and generation of new ideas that enriches the act of creativity. Mind mapping is identified as a form of brainstorming that displays and organizes information and ideas in a formal and concise manner. The art of mind mapping links ideas via the diagrammatic representation of a core concept and their related attributes. This activity is shown to be beneficial in assisting creativity as a physical world process. More importantly, the evolution of IT and the increasing need for efficiency has led to the equivalent formation of physical world processes in the virtual world.
Two examples of virtual world emulations analyzed during the research included The Personal Brain and SOUP applications. The Personal Brain is an application used to mimic the process of mind mapping in an electronic format. It is a software program that organizes files and creates relationships to improve the accessibility and management of information. The SOUP application has characteristics of a anonymous peer review digital suggestion box for creative ideas. The application formalizes the process of creative idea evaluation in order to foster and reward innovation in a collaborative environment.

Another major contribution of this research was a student survey based around their perceptions of the influence of tertiary education on innovation and entrepreneurship. The sample set for the survey was a mix of undergraduate and graduate students across a number of campus locations at tertiary educational institutions in Nigeria. Close to 200 students participated in the survey with each student answering ten multiple choice questions. Statistical analysis was performed on the results to discover any potential trends emerging relating to partnering of entrepreneurship and IT industry, and the current IT tertiary curriculum. The purpose of the student survey was to determine the current perspectives of students studying at a tertiary institution regarding partnering of entrepreneurship and IT.

The student survey consisted of ten multiple choice questions. Each multiple choice question contained options ranging from (A) to (G). Participants selected the most correct answer from their point of view. It was a prerequisite to answers all questions on the survey, as failure to do so voided the respondent's participation. Three out of the ten multiple choice questions in the survey had "other" as an option with a corresponding space for a written comment. The option of "other" was only selected and filled out when the answers provided were not sufficient or more detail was required. There were no right or wrong answers as the perceptions and opinions of the participants were of the utmost importance. A total of 195 students participated in the survey. All participants were enrolled in an IT degree or computing related course at the tertiary institution in Nigeria. Participation was entirely optional and made known to all respondent. Students from the Federal University of Technology ,Minna, the Federal University of Technology,Akure and state College of Education Minna, formed the sample set. Students completed the survey in a paper based hard copy survey. The paper based hardcopy surveys were submitted as optional participation and completed after the student's lectures and/or tutorials of their relevant IT courses. A brief summary of the major statistics and findings for each question from the survey are as follows:

1. 40% of students agree that the current academic structure of university education has a detrimental effect entrepreneurship within IT.

   a. 38% of students are unsure whether or not the current academic structure has a detrimental effect on entrepreneurship within IT.

2. (93%) of students believe that creativity and innovation is either very important or essential to the success and evolution of the IT industry.

   a. 51% - very important
   b. 42% - essential

3. 54% of students agree that entrepreneurship and other business skills should be incorporated into the IT degree.

   a. 79% of students either agree or strongly agree – 25% strongly agree, 54% agree

4. 40% of students agree that there is a lack of freedom to express one's own creativity within the current subjects being studied as part of the IT degree.

   a. 33% of students are neutral.

5. 46% of students believe that entrepreneurship and other business related skills are "very important" to their IT career.

   a. 28% of students are not sure

6. 23% of students who took the survey are currently doing the information technologies applications major

a. 22% - business information systems
b. 21% - information technology

7. 48% of students believe their key motivation for creating something new in the IT industry and fulfilling that idea would be for financial gain
   a. 28% - advancement in IT technology
8. 39% of students use the internet greater than 30 hours a week (on a weekly basis)
   a. 28% - 10-20 hrs
   b. 25% - 20-30 hrs
9. 69% of students were first attracted to the IT industry as their chosen career path for their enjoyment and interest in IT
   a. 14% - opportunities in the job market
   b. 8% - financial reward of the industry and other
10. 34% of students believe that the hardest obstacle to overcome in order to achieve intended success from an entrepreneurial IT idea would be time
    a. 30% - resources
    b. 21% - money

Getting results for fostering Nigerian entrepreneurs

As previously mentioned the major objective of this article was to attempt to bring into an effect the partnering of IT and Entrepreneurship. A parallel objective was to focus the results on deriving achievable outcomes to apply to the Nigerian IT industry. These objectives were reflected in the three primary research questions formulated for the research. While some of the results have been mixed there are a number of positive outcomes that can make positive contributions to more effectively managing technology-based entrepreneurial activities in Nigeria. The remainder of this section, in the limited space provided, details the more prominent results and important contributions of the research. The investigations of ten 'successful' ICT innovations lead to the following deductions termed 'success factors':

1. There is a noticeable trend toward "social networking".
2. The properties of Web 2.0 have a significant impact on the direction of new ICT ventures.
3. The most successful IT innovations and ideas are global competitors on a worldwide ubiquitous platform.
4. The life cycle of an entrepreneurial venture is significantly compressed with an IT innovation. It is important to note that even though the windows of opportunities are smaller, the rapid evolutionary growth of the IT industry induces greater frequencies of these opportunities.
5. The idea of linking, communicating and networking are major contributors to a successful IT innovation.
6. Although one person – usually the founder – may initiate the novel idea of a successful venture, it is rare that the venture is entirely successful without the help of others. It is crucial for any entrepreneurial venture to have a supportive and organized network throughout its life cycle, especially in the start-up phase and phases of growth.

As we expected the results of the student survey were very diverse, with only a strong majority for a single questions but in general a fairly even distribution of responses. In summary around 90% of students felt that Innovation and Entrepreneurship are/ is either very important or essential for to the success and evolution of the IT industry. Further, around 55% agreed that entrepreneurship and other business skills should be a foundational part of a computing degree. What we found most interesting is that only 40% of students perceive current academic programs as having a detrimental effect on creativity, innovation and entrepreneurship within IT. From this we conclude that to protect Nigeria's innovative future it is worth investigating the feasibility of integrating entrepreneurial skills into tertiary computing programs.

Further, creativity and innovation is more affluent when people are provided an environment supporting creative freedom and are encouraged to think laterally and explore ideas that may or may not be worthwhile. Allowing anonymous peer review of ideas, such as supported by the SOUP application, is a positive element for incorporation into innovation fostering initiatives.

Processing the results

The metric of success as defined previously; stated and analyzed five major points in determining the success of an entrepreneurial idea in the IT industry. The five metrics of success were:

1. Sale value or estimated worth
2. Number of registered user or quantities of products sold
3. Product name and brand association
4. Cloning
5. Globalization and localization

This research has shown that innovation is sparked by the three main influences of positive creativity, necessity and opportunity. The results have specified that necessity sparks innovation. The product or process invariably caters for a significant number of people in which those people are prepared to pay money for. Creativity and innovation occurs best in a collaborative environment – industry alliances and partnerships facilitate success. The results throughout the study have shown that there are certain ways to improve the frequency and consistency of IT entrepreneurship in a positive manner. Also the results have shown that a positive attitude toward creativity and innovation enhances entrepreneurship and its related endeavors. An optimistic perspective is a fundamental ingredient to a successful entrepreneurial approach. The optimist sees improvement and knowledge in every possibility. On the other hand, it can be said that the pessimist is naturally afraid of change, a disruption of the status quo or the prospect of something new. The major findings of the research covered many areas of the topics in question. Entrepreneurship was found to be an interesting phenomenon especially when examined within the IT industry. Three clear cut questions were asked of the study and two related hypotheses were made addressing each of the three questions. It was found that creativity, innovation and entrepreneurship are intrinsically linked. However, there is no concrete reason why new innovations and products of an IT nature cannot flourish just as well in other parts of the world. It is clear that opportunity is an important characteristic in the overall success of IT entrepreneurial ventures.

Recommendation

Base on the above findings and discussions the following recommendations are suggested for all stakeholders to accomplish the objectives of the study:

1) Positivity

- The entrepreneur and the innovator should share common basic characteristics such as positive creativity.
- Creativity was found to be innately positive and is a required exercise throughout the entire life cycle of a successful entrepreneurial venture.
- Many IT professionals are self and industry taught – education is only part of the equation. A formal education is a valued part of an entrepreneur's career but there are definitely other facets such as commercial experience, sales experience etc that can have an equal if not greater influence
- Natural flair will shine through in the market. The gifted will always break free from conformity
- Universities focus on educating the masses – however, identifying the gifted at an early stage could increase the frequency of such people making large contributions to the world of innovation in ICT.

2) Promotion of creativity – it can be deduced that the promotion or restriction creativity can prove to be the difference between success and failure of innovation. Therefore should be encouraged.

- Fostering creativity in a positive manner in order to achieve continual innovation is also inevitable.
- 40% of students agreed that the current academic structure of university education has had a detrimental effect on creativity, innovation and entrepreneurship within IT
- over 90% (93%) of students in question two also believed that creativity and innovation was either very important or essential to the success and evolution of the IT industry
- It was also intriguing to note from the results that the idea of mind-mapping has been prevalent for centuries and that the concept was found to have intrinsic links to the fundamental art of learning, brainstorming, memory, visual thinking, and problem solving. The above mentioned characteristics have the capacity in one way or another to form the key derivatives for creativity

3) Empowers potential entrepreneurs and innovators to explore what is possible in an uninhibited manner

4) This unique philosophy and approach to creativity and innovation is evidently entrepreneurial in nature. That is, in order to survive one must adapt or initiate change to increase profit and move technology forward.

5) Whether or not one started as an IT person within the industry or came into the industry with an idea as an entrepreneur/business person outside the IT industry; there is good cause to suggest that success can be attained just as easily. This shows that differing backgrounds is not a determining factor of success in the IT industry.

6) IT innovation is brought about either by:
• Motivation – intrinsic/extrinsic
• Evolution – advancement in technology
• Opportunity – personal/financial gain and/or entrepreneurial opportunity

7) Positive creativity, necessity and opportunity spark innovation

8) Social networking is a lucrative IT entrepreneurial environment It is important to note that the catalyst for change is recreation and innovation and the catalyst for re-creation and innovation is change.

Conclusion and future work

This research has explored the intricacies of IT entrepreneurship. The study identified the importance and potential of entrepreneurial activity in the IT industry and devised a unique classification framework. Factors for the successful fostering of technology based entrepreneurship in Nigeria include collaboration, recognition of compressed life cycles, sound idea execution, recognition of Web 2.0 potential, and due to the critical nature of Nigerians anonymous peer review. To support this we plan on enhancing our SOUP application to increase innovation management functionality. Further, we found that the next generation of entrepreneurs feel somewhat limited by the bounds and rigidity of tertiary education but recognize the importance of creativity.

It was recognized throughout the study that limitations for this type of research were going to be inevitable. A number of limitations were prevalent especially in the early stages of data gathering and analysis. Firstly, considering the online nature and scarcity of resources, the majority of evidence in the literature and technology review was internet based. That is, web pages, websites and online articles. The idea of IT entrepreneurship was also deemed a fairly new topic with little to no papers. A number of books and journal articles were found pertaining to the topic of interest however; they were either out dated or too old for the purpose of the study. The hard copy sources of information were also found to be limited. This included books, journals, and other paper based articles especially in Nigeria where most of our indigenous entrepreneurs have no records of their profiles. The creative aspects of innovation have shown to have an effect on the success of entrepreneurial ventures in the IT industry. The degree of this positive affect is quite complex to measure and not within the scope of this study. The study only signifies the beginning for a number of topics that were addressed in formalizing relationship between entrepreneurship and IT. Our future work aims to continue exploration in this field in increasing detail. Related areas of interest we plan to explore further are the career opportunities in every departments and faculties and the collaboration role of entrepreneurship department.

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